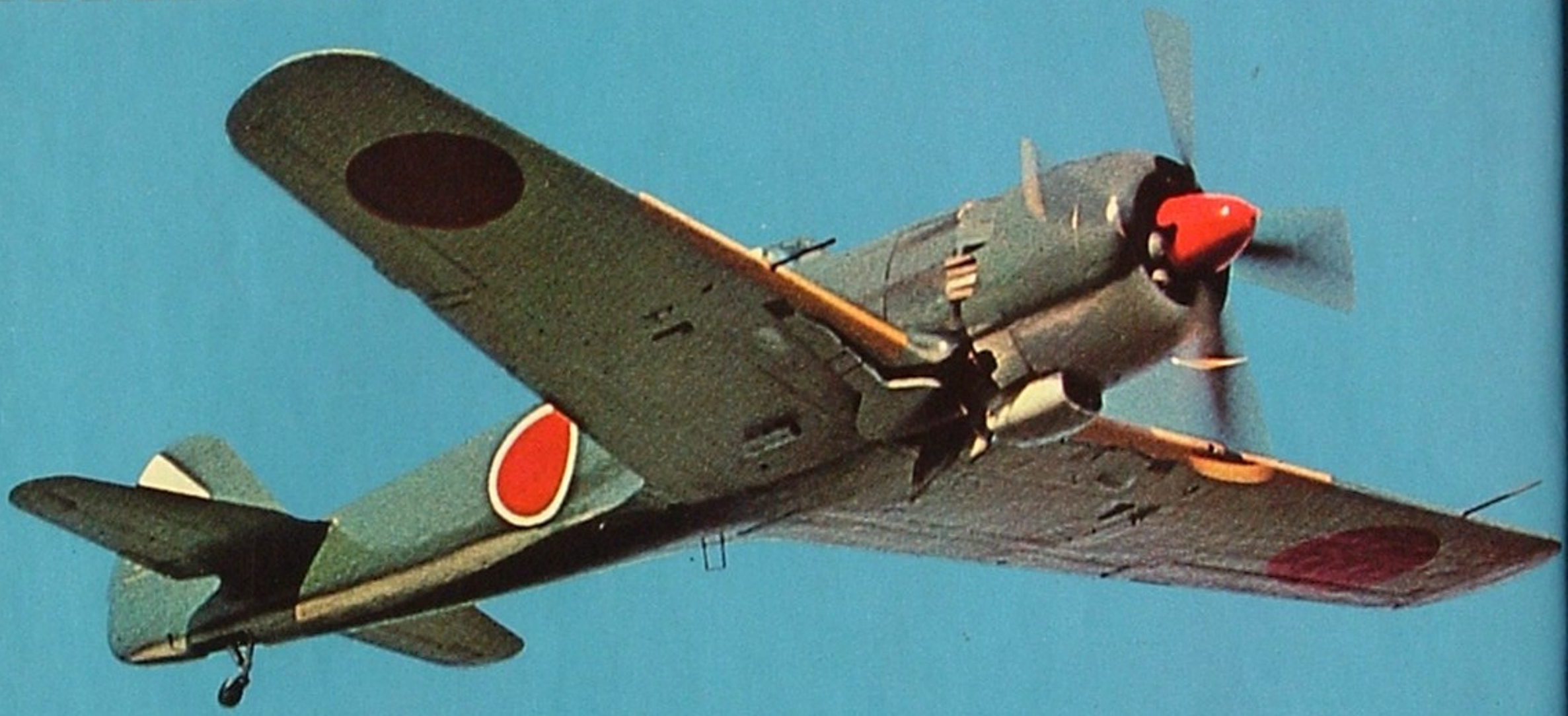
JAPANESE AIRCRAFT OF WORLD WAR II



WITH COLOUR PHOTOGRAPHS

Basil Collier

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JAPANESE AIRCRAFT OF WORLD WAR II

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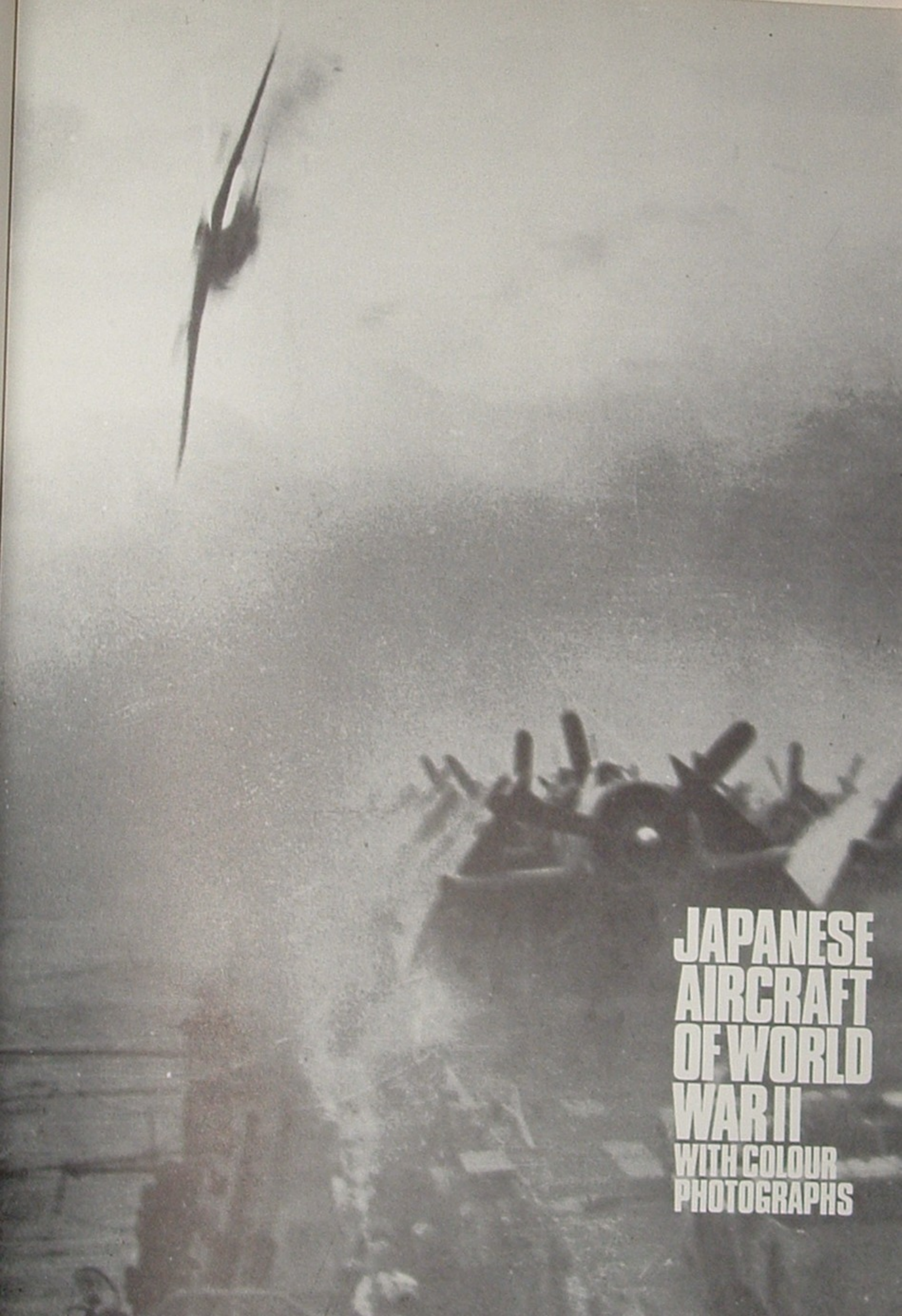
Before the Japanese went to war with the Western powers, they were widely believed to have built no naval or military aircraft comparable to the best European and American bombers and fighters. The crippling of the United States Pacific fleet at Pearl Harbor, followed by the sinking of the **Prince of Wales** and **Repulse,** showed that in fact they possessed carrier-borne and land-based torpedo bombers and dive bombers with exceptional range and striking power. They had an impressive escort fighter and were well equipped with seaplanes and maritime reconnaissance aircraft. It would be hard to over-estimate the contribution made by the Japanese air forces during the first six months of the war. Air power, boldly and imaginatively used, enabled the Japanese to dominate the sea and air approaches to their objectives and thus to maintain and supply their extraordinary forces at a trifling cost in transport and warships sunk.

Basil Collier describes the whole impact of Japanese air power in World War II and traces the course of the war in the air in the Far East and the Pacific. He provides a comprehensive reference section covering all the main types of Japanese naval and military aircraft throughout the war, giving the history of each type of aircraft with their vital statistics. He also provides a description of the designations of the Japanese naval and military aircraft and an account of the Japanese aircraft industry during World War II.

The book is superbly illustrated with magnificent photographs in both colour and black and white.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Acknowledgments
The titles of most of the published works consulted for this book will be found in any standard bibliography of the subject. The author is particularly indebted for facts and figures to the Australian, British and United States official histories; to *Japanese Aircraft of the Pacific War*, by R. J. Francillon (London: Putnam, 1970); and to *Japanese Military Aviation*, by Eichiro Sekigawa (London: Ian Allan, 1974).

The sources of the pictures are given in the List of Illustrations. Thanks for helpful suggestions and recommendations are due to officials of the Smithsonian Institution and the Office of the Assistant Secretary of Defense, Washington, and to Mr D. Hatherell of Beaumont Aviation Literature, London.

1 (Page 1) Kamikaze: A suicide pilot attacks the USS *Sangamon*, 12 April 1945

2 (Previous pages) Hit by AA fire, a Japanese aircraft passes over an American escort carrier

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Colour Plates

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The Far East and Pacific Ocean Areas

1 Japanese Air Power

When Japan opened hostilities against the Western Powers in December 1941, she was in no position to sustain a long war or to gain an outright victory over her opponents. Her productive capacity was far smaller than theirs. She had never been rich in raw materials. Her oil reserves, after reaching a peak at the end of the 1930s, had begun to fall off as a result of increased consumption and restrictions imposed by her suppliers. Her merchant fleet barely sufficed for peacetime needs. Her army was well trained and well equipped, but forty of its fifty-one divisions were committed to a wearisome struggle in China and defensive tasks at home and in Korea and Manchuria. She had ten battleships and six fleet carriers in commission, but on paper Britain and the United States were still the strongest naval powers. Her statesmen, when they decided in November that war was preferable to acquiescence in American proposals, did not aim at annihilating her enemies or bringing them to their knees by a long-drawn process of attrition. They gambled on the hope that spectacular achievements by relatively small forces with strong air support would soon put them in a position to negotiate a settlement on favourable terms.

For a time, the gamble seemed to be succeeding beyond their wildest expectations. Their troops entered Manila within three weeks of the outbreak of war, Singapore within ten weeks. Java and Sumatra were theirs within three months. By the beginning of the monsoon season in South-East Asia, they had driven the British from Burma.

Such rapid progress would scarcely have been possible if their opponents had not contributed generously to their own undoing. By precipitating a diplomatic crisis a good three months before the British and American naval and military authorities expected to complete their preparations for the defence of Malaya and the Philippines, the American Secretary of State, Cordell Hull, ensured that the war would begin at a favourable moment for the enemy. In Oahu and Luzon the Americans allowed themselves to be caught with most of their aircraft on the ground and undispersed, although they had had plenty of time to study the lessons of the war in Europe. On the strength of rumours and unconfirmed reports, the British abandoned the position at which they had elected to stand in northern Malaya without waiting for the main body of the Japanese 5th Division to attack it.

Even so, the Japanese could not have captured Singapore a month ahead of schedule if they had not made good use of their opportunities. According to a Japanese officer closely concerned with the planning of the campaign in Malaya, the swiftness of their advance along the trunk road from Siam and northern Malaya to Johore was attributable not to the special aptitude for jungle warfare imputed to them by Allied commentators, but to 'expensive British roads and cheap Japanese bicycles'. But they also owed something to the weakness of the opposition. The defenders of Malaya were handicapped not only by the mistakes they made but also by the meagreness of their resources. On the outbreak of war they had roughly two-thirds of the troops considered necessary in the absence of the strong fleet due to assemble at Singapore by the following March or April. They started with 158 aircraft (some of them obsolete) towards an estimated minimum requirement of 336 and a target figure of 582. About half the troops in northern Malaya on the outbreak of war were directly or indirectly committed to the defence of airfields which had to be denied to the enemy, although many of them served no useful purpose because there were no squadrons there. The one division available for the defence of the trunk road had been standing by for forty-eight hours for an advance into Siam when it was switched to its alternative position at Jitra because the Commander-in-Chief of the British land and air forces in the Far East was understandably reluctant to violate Siamese neutrality except in circumstances which arose too late for the advance to be made. Once the Jitra position was abandoned, a lavish allocation of mechanically-propelled vehicles became more of a burden than a benefit to troops retreating along a single route. The Japanese travelled light. They were willing to incur the odium of disembarking troops in Siamese territory and seizing airfields throughout southern Siam. Above all, they had plenty of air support.

The importance of the contribution made by their air forces to the successes gained by the Japanese during the first six months of the war would be hard to overestimate. Air power, boldly and imaginatively used, enabled them to dominate the sea and air approaches to their objectives, to maintain and supply their expeditionary forces at a trifling cost in transports and warships sunk. Without ample air support, eleven divisions supplemented by naval landing parties would not have been anything like equal to the task of conquering vast territories and seizing isolated outposts in an area extending

3 The 'China Incident': Japanese warships and a Mitsubishi A5M2 fighter off the Chinese coast

from the Indo-Burmese frontier in the west to the Gilbert Islands in the east and the Indonesian archipelago, New Guinea, and the northern Solomons in the south.

Rearmament

Before the Japanese went to war with the Western Powers, they were widely believed to have built no naval or military aircraft comparable with the best European and American bombers and fighters, although there was evidence to the contrary in reports from British and American observers in China. The crippling of the United States Pacific Fleet at Pearl Harbor, followed by the sinking of the *Prince of Wales* and the *Repulse* off the east coast of Malaya, showed that in fact they possessed carrier-borne and land-based torpedo-bombers and dive-bombers of exceptional range and striking-power. The A6M2 escort-fighter was equally impressive. They were also well provided with seaplanes, flying-boats, and landplanes for tactical, strategic, and maritime reconnaissance.

These aircraft were products of more than eight years of research, experiment, and practical experience. As a result of political upheavals which substantially increased the power and influence of the army and the navy, Japan began in the first half of the thirties to expand her aircraft industry and strengthen her air forces. Her ultimate aims were to make herself independent of foreign suppliers and strong enough to assert her claim to a dominant role in East Asia. In the meantime the military authorities were concerned, both before and after the outbreak of an undeclared war with Nationalist China, to support their troops on the mainland and safeguard them against attacks by Chinese, Mongolian, and Soviet forces armed and subsidised by the Western democracies and the Soviet Union.

This remained a major preoccupation until – and even after – detailed planning for war with the Western Powers began in 1941. All the first-line aircraft with which the Japanese Army Air Force was equipped on the outbreak of the war of 1941–5 were built to specifications issued in 1937 or earlier, and to standards intended to fit them for service in temperate and sub-Arctic climates. They were not particularly suitable for an offensive against the Western Powers in South-East Asia and the South-West Pacific, and in any case the military authorities could not afford to devote more than about half their first-line aircraft to the task. The navy had, therefore, not only to deal with the American battlefleet and be ready to tackle any heavy ships the British might send to Singapore, but also to find more than half the aircraft needed to knock out the enemy's airfields and gain air superiority over beaches and roadsteads.

The nucleus of a powerful naval air striking force already existed when rearmament began. The Washington Naval Treaty laid down the principle that no aircraft carrier should displace more than 27,000 tons; but the Americans were allowed to save two unfinished battleships from the scrapyard by completing them as outsize carriers. The Japanese took advantage of a concession which allowed them to follow suit. At the cost of locking up most of their permitted carrier tonnage in two ships, they completed in 1927 and 1928 the 36,600-ton *Akagi* and her sister-ship the *Kaga*. Each carried about seventy aircraft, as compared with about twenty carried by the light fleet carrier *Hosho*. After exercising their right to denounce the treaty, they followed between 1937 and the autumn of 1941 with the *Soryu*, the *Hiryu*, the *Shokaku*, and the *Zuikaku*. These, too, carried about seventy aircraft apiece, although their displacements were within the treaty limit of 27,000 tons. Two more light fleet carriers, the 8,500-ton *Ryujo* and the 13,000-ton *Zuiho*, were completed in 1933 and 1940.

A wide range of Japanese-designed carrier-borne fighters, torpedo-bombers and dive-bombers was developed during the first few years of the rearmament drive. The B5N2 torpedo-bombers and D3A1 dive-bombers which attacked the American battlefleet at Pearl Harbor on 7 December 1941 were of a later generation, but not so late that they were acquired with the Pearl Harbor operation specifically in view. The B5N2, which first flew in 1939, was virtually identical, except for its engine, with the B5N1 of 1937; the D3A1 was built to meet a specification issued in 1936. A surprise attack on Pearl Harbor was first mooted early in 1941, some seven or eight months after the Americans decided to leave their main fleet there at the conclusion of an exercise in Hawaiian waters; but rehearsals did not begin until September, and the project was not formally adopted until November.

The Pearl Harbor project was sponsored, and is said to have been initiated, by the redoubtable Isoruku Yamamoto. In common with other Japanese naval officers of his generation, Yamamoto disapproved of the Tripartite Pact with Germany and Italy, distrusted the Russians, and would have liked Japan to remain on good terms with the Western Powers. He thought that, if she did go to war with the United States, she would probably have cause to regret her decision, but that the risks she ran would be substantially reduced if the navy could find a way of knocking out the American battlefleet at an early stage.

It was also at Yamamoto's prompting that the navy developed the aircraft which sank the *Prince of Wales* and the *Repulse*, although again these aircraft were designed, tested, and put into production long before the Japanese had occasion to use them against the British. In 1933, Yamamoto persuaded the authorities that land-based as well as carrier-borne long-range bombers would be needed in a war fought over vast distances in the Far East and the Pacific. The G3M1 dual-purpose land-based bomber and torpedo-bomber was built to a specification issued in 1934, went into production in 1936, and was followed in 1937 by the G3M2. A prototype of the more advanced G4M1 made its maiden flight in October 1939. Both aircraft were used against objectives in Nationalist China many months before the arrival of the *Prince of Wales* and the *Repulse* at Singapore led the Japanese naval authorities to reinforce the 22nd Air Flotilla in southern Indo-China for the express purpose of attacking British warships should diplomatic negotiations still in progress fail to avert war.

Design and Function

The astonishing feats performed by the Japanese naval air arm in the first few days of the war showed that it was far more powerfully equipped and better organized than the Western Powers had supposed. Its achievements gave a rather flattering impression of the fighting value of its aircraft; but its aircraft did not have to do much fighting. At Pearl Harbor the first wave of torpedo-bombers, dive-bombers, and escort-fighters met scarcely any opposition, the second wave very little. Hong Kong had practically no air defences. The defenders of Luzon put up only one fighter squadron when a large formation of Japanese naval aircraft approached Manila on the first day. The Japanese Twenty-Fifth Army soon gained mastery of the air over northern Malaya by seizing airfields in Siam while the enemy's meagre striking force was preoccupied with attacks on transports and landing-craft. The *Prince of Wales* and the *Repulse* had no air cover, although help could have been forthcoming if the British admiral had reported his position as soon as he found that hostile aircraft were shadowing him in an area within reach of British fighters.

Comparisons between rival air forces are inevitable, but can be misleading. A nation develops the aircraft it thinks it will need. From the moment when the British began to rearm in the 1930s, they were convinced that, if they had to go to war, sooner or later their centres of industry and population would become targets for German bombers. They provided themselves with an unrivalled system of air defence and built fast, highly manoeuvrable, short-range fighters. The Germans, short of artillery and mindful of the lessons of the Spanish Civil War, built bombers, fighters, and reconnaissance aircraft well suited to the tactical and strategic support of armies in the field. The Americans, at one time confident that the only war into which they were likely to be drawn would be one fought for the defence of their possessions in the South-West Pacific, attached much importance to carrier-borne striking forces and long-range maritime-reconnaissance aircraft, but became keenly interested in the B–17 army bomber when their strategists foresaw that the national interest might require them to send air forces to Europe or Africa as participants in a struggle between the European democracies and the Axis Powers. The Japanese, a maritime but also a military nation, were acutely conscious of the huge distances that separated them from the vital centres of their hereditary enemies the Russians, of the implications of a war fought over vast expanses of blue water in the Pacific. In the design of nearly all their aircraft except those intended for tactical support of troops, they consciously sacrificed armour and defensive armament to range and speed.

Such differences of emphasis should put students of air power on their guard against reading too much into statistical comparisons. The Me 109E was faster than at least two-thirds of the fighters used by the British in the Battle of Britain. It was more powerfully armed than most of them. But the British won the battle. The B5N2, the D3A1, the G4M1, even the well-armed A6M2, were by British and American standards unacceptably vulnerable to return fire. But the Japanese, with land forces hugely dependent on air power, conquered in less than six months all they had set out to conquer.

On the principle that in war only results count, the Japanese cannot be said to have been ill equipped for the offensive they had in view when hostilities began. They were not so well equipped for a defensive role. The Tokyo raid of April 1942 was a straw in the wind which might have suggested that the time had come for them to overhaul their panoply of war with such a role in view. But they did not take the hint. When confronted with the problem of holding the territories they had won, in effect they departed from their planned strategy by refusing to stand on the defensive. They preferred to aim at putting it out of the enemy's power to hit back from secure bases. This they believed they could do by bringing the American carrier fleet to action in the Central Pacific and by seizing Antipodean outposts which would place them across the reinforcement route between the continental United States and Australasia.

The Coral Sea and Midway Island

The abortive seaborne expedition to Port Moresby which led to the Battle of the Coral Sea was planned in January, when the Japanese were still thinking in terms of a defensive perimeter intended to run from the Indonesian archipelago through New Guinea to the Gilbert Islands. It was launched in the context of the new strategy which envisaged fresh conquests in the South Seas. The naval authorities expected the Port Moresby Invasion Force and an accompanying light fleet carrier, the recently-completed *Shoho*, to be opposed by carrier-borne and land-based aircraft, but counted on a supporting sweep by the *Shokaku* and the *Zuikaku* to bring them another resounding triumph. They could not foresee that American carrier-borne aircraft searching in the wrong direction for their fleet carriers would disrupt their plan by chancing upon the *Shoho* and sinking her. In the ensuing battle between two Japanese and two American fleet carriers – the first of its kind in naval history – the Americans lost the *Lexington* and their torpedo-bombers were conspicuously unsuccessful. The Japanese suffered only superficial damage to one of their carriers and trifling damage to the other, but broke off the action in the belief that both American carriers had sunk. The withdrawal of their fleet carriers and the loss of the *Shoho* compelled them to recall the Port Moresby Invasion Force, which never reached the Coral Sea.

The true significance of these events was not clear at the time. While the battle was still in progress, the Australian press and radio described it as one which would decide the future of Australia. It did decide the future of Port Moresby; but even that did not become apparent until losses suffered in the decisive Battle of Midway Island forced the Japanese to give up the whole idea of a seaborne expedition. A disastrous attempt to pass troops to Port Moresby by an overland route without adequate air cover then exploded the myth of Japanese invincibility.

The Battle of Midway Island brought the confrontation on which the Japanese were counting to complete the destruction of American naval power. They looked forward to it with a confidence which might have seemed to an impartial observer not ill founded. Without calling on the *Shokaku* and the *Zuikaku*, they were able to assemble an air striking force of four large carriers. Their opponents had three. Their carrier-borne aircraft had a bigger radius of action than the enemy's, their naval airmen were as well trained as any in the world. Their torpedoes were not only superior in range, speed, and weight of warhead to those used by the Americans, they were also more reliable.

The Americans did, however, have the benefit of foreknowledge of the enemy's intentions, and they were able to use Midway Island as a base for bombers, fighters, and maritime-reconnaissance aircraft. Their land-based bombers scored no hits on Japanese carriers, their land-based Buffalo and Wildcat fighters proved no match for the A6M. But these aircraft did make an indirect contribution to the resounding victory won by the American carrier force. Their intervention after the Japanese commander had sent a striking force to deliver a softening-up attack on Midway Island led him to order dive-bombers and torpedo-bombers which were standing by to attack any American warships that might appear to rearm in readiness for a further attack on objectives ashore. He rescinded the order after learning that American ships were approaching his fleet. The result was that the arrival of torpedo-bombers and dive-bombers from the American carriers caught him at a moment when he was in the midst of recovering the aircraft despatched earlier in the day, and when some of his remaining aircraft were still armed with the wrong weapons and others in the process of exchanging them for the right ones. Again the American torpedo-bombers were unsuccessful, but in the course of the day all four of the Japanese carriers were put out of action by dive-bombers from two American carriers, the *Enterprise* and the *Yorktown*. The *Akagi*, the *Kaga*, and the *Soryu* sank within a few hours of the first attack, the *Hiryu* next morning.

The destruction of these four ships was the beginning of the end for the Japanese. The loss of most of the troops sent towards Port Moresby by a difficult route through the Papuan jungle was only one of a series of reverses inflicted on them during the next few months. Not only in Papua, but also elsewhere in New Guinea and in the Solomons, their attempts to take or hold positions outside or close to the limits of the shelter provided by their air umbrella were consistently unsuccessful. Repeated setbacks brought demands for more and better long-range aircraft. To some extent the authorities were able to meet these demands by introducing new models or improved versions of existing models; but they also had recourse to the doubtful expedient of disembarking units from surviving carriers and stationing them at land bases. Consequent losses, not merely of aircraft but of skilled airmen, reduced their chances of success in the hypothetical naval battle on which they relied to restore their fortunes. They made creditable attempts to increase the output of their aircraft industry, but could not match the huge productive capacity of their opponents. Many of the aircraft they did produce were entrusted to pilots not qualified by experience to make the most of their opportunities. Shortages of aviation fuel and of raw materials, and wasteful competition between the naval and the military authorities, were among other factors that contributed to their undoing.

It may be asked how they managed to hold out so long when so much was against them. No simple clear-cut answer can be given to that question. Careless of life and fearful of dishonour, the Japanese fighting man did not give up easily, even in face of hopeless odds. So many courses of action seemed to be open to the Western Powers in 1942 that they would not have found it easy to hit upon a good way of ending the war quickly, even if their councils had not been troubled by inter-service rivalries and divergent national aims. The Combined Chiefs of Staff Committee they set up to supervise the conduct of the war by their armed forces could function efficiently only insofar as its members were well informed about the matters they had to consider and had some degree of control over the allocation of resources.

The Combined Chiefs exercised little control over the allocation of resources in the Pacific theatre, and sometimes had great difficulty in discovering what was going on there. At summit conferences, conclusions about Far Eastern strategy tended to be so broad, so thickly beset with provisos, as to offer little guidance to commanders-in-chief who did not always wish to be guided. Clearly, the Western Powers could have ended the war without recourse to nuclear bombing. With that exception, perhaps there was after all no course they could have taken apart from the course they took. If there was one, their failure to find it and agree upon it does not, on the whole, seem nearly as surprising as their failure to avert the diplomatic breakdown which plunged them into a war they were ill prepared to wage.

4 Torpedo-bomber: A Nakajima B5N2 in action during the Battle of the Santa Cruz Islands, October 1942

2 The Japanese Aircraft Industry

The Japanese military authorities built their first aeroplane in 1911. This was the year in which the British Army's balloon factory at Farnborough became the Army Aircraft Factory. It was also the year in which Germany startled the world by sending a gunboat to Agadir and bombs from an aeroplane were used for the first time in war. The place was Tripoli, where the Italians were fighting the Turks. The innovator was accused of bombing a hospital, but protested that there was no hospital within miles.

Two years earlier, in 1909, Louis Blériot had made the first cross-Channel flight and Hans Grade the first flight made in Germany by the German-born pilot of a powered heavier-than-air machine.

But the aircraft constructed at the Japanese Army's balloon factory at Nakano in 1911 was not built to an original design. It was modelled on an imported biplane built in France by the French-domiciled Englishman Henry Farman. Five years elapsed before two naval officers, Chikuhei Nakajima and Kishichi Magosi, designed a seaplane which ranks as the first man-carrying powered aircraft designed and built wholly in Japan.

That was in 1916. In 1917 Nakajima founded the Japanese aircraft industry by setting up as an aircraft manufacturer in partnership with Seibei Kawanishi. Two years later the partnership was dissolved. Nakajima then formed the Nakajima Aeroplane Company (Nakajima Hikoki KK) with financial backing from the Mitsui family. Kawanishi did not re-enter the aircraft industry until 1921, when his engineering company completed its first seaplane. Later the company became the Kawanishi Aircraft Company (Kawanishi Kokuki KK).

Meanwhile two industrial concerns of considerable standing became interested in aviation. In 1918 the shipbuilding firm of Kawasaki set up an aircraft division and Mitsubishi sent an envoy to France to study the role of aircraft in the First World War. Two years later Mitsubishi formed a subsidiary company concerned primarily with internal combustion engines, but empowered by its articles of association to manufacture aircraft and engines for them as well as engines for motor-cars and lorries. After changing its name to the Mitsubishi Aircraft Company, this offshoot was merged with the parent company as the aircraft and aero-engine division of Mitsubishi Heavy Industries (Mitsubishi Jukogyo KK). Kawasaki formed a wholly-owned subsidiary, the Kawasaki Aircraft Engineering Company, which eventually became a separate enterprise.

Other pioneers of aircraft manufacture in Japan were the Aichi Clock and Electric Company, which began to build airframes in 1920, and the Watanabe Ironworks Company. Watanabe began by manufacturing components, but afterwards built fighters, patrol aircraft, and trainers of its own design in addition to wheels, fuselage panels, and complete aircraft manufactured or assembled to designs sponsored by other firms or by government agencies. During the Second World War the Aichi Aircraft Company was formed to take over Aichi's airframe and aero-engine interests, and Watanabe was reorganized as the Kyushu Aeroplane Company.

The Tachikawa Aeroplane Company (Tachikawa Hikoki KK) was formed in 1924. Its output remained small until 1941, when huge additions were made to its plant. The Japanese Army's First Air Arsenal (Dai-Ichi Rikugun Kokusho) was also at Tachikawa, as was the army's Aerotechnical Research Institute (Rikugun Kokugijutsu Kenkyujo). Other government arsenals which eventually became of considerable importance to the aircraft industry were the 1st, 11th, and 21st Naval Air Arsenals at Kasumigaura, Hiro and Sasebo, the Koza Naval Air Arsenal at Koza, and the 1st Naval Air Technical Arsenal (Dai-Ichi Kaigun Koku Gijitsusho) at Yokosuka.

Towards Self-sufficiency

By the beginning of the thirties the Japanese were, therefore, fairly well provided with the means not only of building but also of designjng their own aircraft. At least half a dozen commercial firms, in addition to the arsenals at Kasumigaura and Yokosuka, could call on the services of competent engineers, some of them graduates of foreign universities. The fact remains that, for nearly fifteen years after the First World War, the Japanese naval and army air forces relied largely on imported aircraft, aircraft of foreign design built under licence, or copies or modifications of such aircraft. One reason was that, as long as Japan adhered to the Washington Naval Treaty and was ruled by statesmen who shared the British and American view that the piling up of armaments was a potent cause of international disputes, the demand for naval and military aircraft was fairly small.

However, circumstances alter cases. Japan was hard hit by the world economic crisis that followed the Wall Street crash of 1929. Well-meaning but bewildered political leaders, accused by self-styled patriots of selling out to Big Business and subordinating the interests of landowners, farmers, and peasants to those of the urban proletariat, lost control of events at home and abroad. When a mysterious explosion led to an exchange of shots between Chinese troops and the Japanese Kwantung Army in Manchuria, the Kwantung Army took it upon itself to occupy strategic points throughout the region and set up the puppet state of Manchukuo. Armed bands roamed the streets of Tokyo, assaulting persons of whom they disapproved. In the spring of 1932, after serious trouble had arisen in China and at home, two prominent industrialists and a prime minister had been murdered, the Emperor was advised to abandon the party political system and appoint a non-party government. The country's new leaders gave formal recognition to Manchukuo, took Japan out of the League of Nations, and sanctioned military reforms for which army officers had long been pressing.

Thereafter Japan's policy was to re-equip her naval and army air forces with aircraft of Japanese design and manufacture. Foreign aircraft were still bought, but only for study or to serve as stopgaps until Japanese aircraft were ready. New firms entered the industry. One of the first was the Japan Aeroplane Company, formed in 1934. Three years later, the outbreak of an undeclared but ferocious war with the Nationalist China of Chiang Kai-shek gave the arms trade a further boost. So did the fear of an all-out attack by the Soviet Union and a number of clashes with Soviet forces on the borders of Outer Mongolia and Siberia. In 1937 the Ishikawajima Aircraft Industries Company was formed as an offshoot of the shipbuilding firm of that name. The Manchurian Aeroplane Manufacturing Company (Mansyu Hikoki Seizo) was established with government support in 1938. The Hitachi Aircraft Company and the Showa Aeroplane Company followed in 1939.

The new firms were small in comparison with such giants as Nakajima and Mitsubishi, but some of them were destined to make valuable contributions to the national output during the Second World War. Hitachi produced nearly 1,800 aircraft and some 13,000 aero-engines between 1941 and 1945, though none of the aircraft was of combatant type. Mansyu Hikoki built well over 2,000 engines and roughly the same number of aircraft. These included some 800 combat aircraft built under licence. The Japan Aeroplane Company (Nippon Hikoki) contributed nearly 3,000 aircraft, mostly trainers. There is some conflict of evidence as to Showa's contribution, but it seems to have included at least 200 D3A2 dive-bombers built for the navy.

Government Control

In 1938 the government secured a substantial degree of control over the industry by requiring every aircraft manufacturing company with a capital of 3,000,000 yen or more to take out a licence and submit its production and expansion programmes to official scrutiny. In return the companies were granted various tax reliefs and remissions. These controls were tightened when the spring of 1941 brought a visible decline in Japan's prospects of gaining access to the raw materials of the Netherlands East Indies without having to fight for them. But they did not by any means ensure that the best use was made of the available resources. At any rate during the first two years of the war of 1941–5, men were called up for the armed forces without regard to the needs of the aircraft industry. At the same time, little was done to curb wasteful competition between the services. Some aircraft manufacturers catered only for the army or the navy, some for both. By steering raw materials which they controlled towards the firms of their choice, the naval and military authorities could exert a considerable influence on the pattern of production.

In 1943 the government at last set up a Ministry of Munitions to control the allocation of labour and supplies. By that time there was virtually no skilled labour left to allocate, and the industry had become accustomed to the system, or lack of system, by which raw materials had been shared out in the past. Eventually an arrangement was worked out by which the ministry and the service departments agreed on monthly quotas for each factory, in the light of reports from manufacturers on their

productive capacity and estimates of requirements prepared by the Supreme Command. From 1943 the authorities aimed not at expanding the industry but at making the best possible use of existing plant and floor-space.

By American standards the output of the Japanese aircraft industry was small. By any standard its growth during the war years was impressive. According to figures compiled by the American authorities after the war, the Japanese produced an average of roughly 900 aircraft a year from 1933 to 1936, about 3,800 a year from 1937 to 1941. In 1942 they produced 8,861 aircraft, in 1943 16,693. In 1944 their output reached a peak of 28,180 aircraft. Thereafter it fell off sharply. About 1,500 aircraft a month were delivered in the first seven months of 1945, as compared with roughly 2,350 a month in the previous twelve months.

Undoubtedly Allied bombing was the most important single cause of the decline. Contributory factors included an earthquake in the Nagoya area towards the end of 1944; the cumulative effect of chronic shortages of raw materials; the growing dilution of labour by unskilled workers. In factories not directly affected by air attacks, output fell off partly because the conditions created by repeated air raids led people to stay away from work in order to search for food and shelter for themselves or their families; partly because most people were tired anyway. According to a Japanese interpretation, in the middle period of the war the aircraft industry made a supreme effort to equip the armed forces for decisive battles expected in the summer of 1944. Once those battles were fought and lost, another such effort would have been possible only if the industry had been given time to rest workers exhausted by long hours in the factories and to make fresh plans for the future. That did not happen.

However that may be, it is obvious that, even if the Japanese had been able to maintain or increase the output of their aircraft industry at the end of 1944 and in 1945, they would have gained nothing by adding to their stock of aircraft already found unsuitable for current needs. In 1941 they had possessed, in the D3A1, the B5N2, the G4M1, and the A6M2, some of the best carrier-borne and land-based dive-bombers, torpedo-bombers, and medium-to long-range escort-fighters in the world. These aircraft had been designed and built in response to demands formulated between 1935 and 1937. In 1944 they needed high-altitude interceptor fighters, in 1945 first-class night-fighters equipped with airborne radar. To provide themselves with adequate numbers of such aircraft in good time, they would have had to start thinking in terms of defensive requirements between 1939 and 1941, or at the latest by 1942. As things were, their preoccupations in 1941 were essentially offensive. Even when things began to go badly for them in 1942, they persisted in attempts to increase the area they would have to defend.

The Japanese, of course, were never in a position to gain an outright victory over the Western Allies. Their merchant fleet barely sufficed for their peacetime needs. Their conquests in Malaya and the Netherlands East Indies gave them access to the raw materials they had lacked before the war. But their victories were Pyrrhic victories, because they lacked the means of carrying the spoils home and, at the same time, supplying their armed forces in China, Manchukuo, South-East Asia, and the Pacific. Their failure to convince their enemies by the summer of 1942 that they had won on points meant that sooner or later they were bound to be knocked out. Yet, although they could not hope after the Battle of Midway Island to escape ultimate defeat, it is still true that timely attention to the needs of a defensive strategy might have helped them to postpone it. For the Western Allies the high-altitude raids of 1944, the area attacks of 1945, the dropping of nuclear bombs on or near Japanese cities in broad daylight would have been difficult, to say the least, if the Japanese had been in a position to dominate their own air space. Some good defensive fighters did emerge from Japanese factories towards the end of the war, but they were too few and they came too late. They needed further development to make them effective.

5 Dive-bomber: An Aichi D3A2

The fact remains that the achievements of Japanese aircraft manufacturers between 1941 and 1945, and even between 1933 and 1940, exposed the fallacy of the belief, widely held before the war, that they were capable of producing only copies of obsolescent European and American machines. If the figures cited in the United States Strategic Bombing Survey are correct, they produced between 1941 and 1945 some 50,000 fighters, bombers, and reconnaissance aircraft, nearly 70,000 aircraft of all classes. Many were of exceptional quality, even by British, American, and German standards. About three-quarters of the fighters, bombers, and reconnaissance aircraft came from Nakajima (37 per cent), Mitsubishi (23 per cent), and Kawasaki (15 per cent). Aichi produced about 7 per cent, Tachikawa 6 per cent, government arsenals about 4½ per cent, Kawanishi and Watanabe or Kyushu each about 3 per cent, smaller firms about 1½ per cent. But these figures do not accurately reflect the contributions made by the various firms to design and development. Some aircraft designed and developed by one firm were manufactured in large numbers by another, or by several others; some of the smaller firms produced substantial numbers of aircraft sponsored by government arsenals. Nearly ten times as many A13A1 seaplanes designed and developed by Aichi, for example, were built by Watanabe or Kyushu as by Aichi themselves.

If trainers and transport aircraft are included, Nakajima with 28 per cent, Mitsubishi with 18 per cent, and Kawasaki with nearly 12 per cent still head the list. Tachikawa – prolific manufacturers of small training aircraft – come next with 9½ per cent and are followed by Aichi with 5 per cent. Firms which produced between 2½ and 4 per cent of all aircraft manufactured in Japan or Manchukuo between 1941 and 1945 include Nippon Hikoki, Watanabe or Kyushu, Mansyu, Kokusai, Kawanishi, and Hitachi. Government arsenals produced between 3 and 4 per cent of the total, six smaller firms the remaining 4 per cent.

Mitsubishi and Nakajima, in that order, were by far the largest producers of aero-engines. Of 116,577 engines said to have been manufactured between 1941 and 1945, Mitsubishi are credited with producing about 36 per cent, Nakajima some 31 per cent, Hitachi nearly 12 per cent. Kawasaki, according to the American figures, produced rather less than 9 per cent. Government arsenals were responsible for some 5 per cent. The rest were produced by six firms, none of whom contributed more than 2 per cent of the total output. These figures are for aero-engines of all kinds. Most of the first-line fighters, bombers, and reconnaissance aircraft used against the Western Allies were powered by Mitsubishi or Nakajima engines, relatively few by engines designed and built by Kawasaki or Aichi.

Dispersal

The greater part of the Japanese aircraft industry was concentrated until the latter part of the war at or near Tokyo, Nagoya, and Osaka. These places were beyond the reach of B–29 bombers based in India and refuelling at Chengtu in China, but could be reached by B–29s from the Marianas. When the Americans took Kwajalein in the Marshall Islands early in 1944, the Japanese authorities recognized that they could not count on holding the Marianas. A plan was made to disperse aircraft production to factories wholly or partly below ground, but the Supreme Command hesitated to put it into effect for fear that the immediate effects on output might be disastrous. In the following November and December manufacturers began on their own initiative to shift plant to places they considered relatively safe. In February 1945, the authorities made compliance with official plans for dispersal obligatory and decreed that aircraft manufacturers should have first call on building facilities and transport. But they had waited too long. Only a few aircraft and aero-engines built in underground factories were completed before the end came in August. The victorious Allies, when they entered Japan, found large quantities of plant dispersed in mines and quarries, old or newly-constructed tunnels, even the basements of large shops. Schools, mills, and warehouses in various parts of the country were crammed with the paraphernalia of sub-contractors.

3 The Course of the Air War

Prelude to War

Early in the First World War, the Japanese placed themselves across the lines of communication between the United States and the Philippines by occupying the German colonies in the Marshall, Caroline, and Mariana Islands. They also seized the German concession at Tsingtao, in the Chinese province of Shantung.

At the end of the war, Japan was awarded League of Nations mandates for the islands occupied by her troops. She was even allowed to retain a foothold in Shantung, but not for long. As the outcome of pressure exerted by the United States on her wartime associates, the Tsingtao concession was relinquished a few years after the war to the Chinese; the twenty-year-old alliance between Japan and Britain was allowed to lapse; and the Japanese accepted at Washington a naval treaty which allowed the Americans and the British to maintain substantially larger battlefleets than theirs. But by special arrangement Japan and the United States were each allowed to complete as outsize carriers two projected battleships which would otherwise have been scrapped.

The Japanese thus acquired the *Akagi* and the *Kaga*, the Americans the *Lexington* and the *Saratoga*. The possession of ships capable of carrying about seventy aircraft each encouraged the navies of both countries to develop specialist carrier-borne fighters, dive-bombers, and torpedo-bombers. The British, contenting themselves with smaller carriers which many naval strategists thought more likely to be useful in a future war, tended to rely more on multi-purpose carrier-borne aircraft which were not particularly efficient in any role.

After accepting the Washington Naval Treaty and withdrawing from Shantung, Japan reduced the peacetime strength of her army by four divisions and appeared to have relinquished, at least for the time being, any intention of establishing herself on the mainland of Asia by means other than peaceful economic penetration. She claimed no territorial rights in China, but was allowed to maintain a Garrison Army near Tientsin to protect her nationals in the legation quarter at Peking, and a force called the Kwantung Army in Manchuria to safeguard her economic interests there. Like the other treaty powers, she was also entitled to station a small force in the International Settlement at Shanghai.

6 A Mitsubishi A6M3 fighter photographed during an Allied attack on Japanese transports off Bougainville, October 1942

However, in Japan as in many other countries, one effect of the economic troubles that followed the Wall Street crash of 1929 was to undermine confidence in popularly-elected governments. At the London Naval Conference of 1930 Japan accepted further naval restrictions. Her Chief of the Naval Staff resigned in protest, and the government was accused of defying the constitution by disregarding his advice. The sequel was an angry controversy whose echoes were still reverberating when, in the following year, a mysterious explosion damaged the Japanese-controlled South Manchurian Railway. Shots were exchanged between the Kwantung Army and Chinese troops. The Kwantung Army then seized strategic points throughout Manchuria and set up the puppet state of Manchukuo.

The Chinese retaliated by boycotting Japanese goods. The Japanese delivered an ultimatum and disembarked at Shanghai an expeditionary force which advanced about twelve miles before mediators persuaded it to withdraw on the ground that the ultimatum had been accepted.

These events had far-reaching effects on Japan's relations with foreign powers. The Chinese alleged that Japanese agents had staged the railway incident in order to provoke a clash. The almost universal credence given to this allegation outside Japan aroused so much indignation in Tokyo that the government became no more capable of suppressing violent demonstrations by right-wing extremists than it was of restraining the Kwantung Army. In the spring of 1932 the Emperor, acting on advice, dismissed his ministers and appointed a non-party government which recognized Manchukuo, gave notice of Japan's impending withdrawal from the League of Nations, and sanctioned reforms which many army officers considered long overdue. These included re-equipment of the naval and army air forces with aircraft of Japanese design and manufacture. Two years later, the Japanese exercised their right to denounce the Washington Naval Treaty, with the result that, when the London Naval Treaty expired at the end of 1936, they became free to build all the warships they could afford.

Even so, Japan was still far from wishing to engage in a major war. Between 1932 and 1937 she aimed at curbing Russian ideological penetration of China and increasing her own power and influence there and throughout East Asia. She recognized that these aims might bring her into conflict with the Soviet Union and the Chinese Nationalist government of Chiang Kai-shek, but hoped by skilful diplomacy to avoid a situation in which the two might sink their ideological differences and combine against her.

As things turned out, she was unable to prevent the Moscow-schooled leaders of the Chinese Communist Party from making considerable headway with Chiang Kai-shek. Alarmed by the prospect of an alliance between Nanking and Moscow, she accepted in 1936 a German offer of a pact ostensibly directed against the Communist International but containing secret clauses which bound both parties to give no help to the Soviet Union should either of them be attacked from that quarter.

The 'China Incident'

In the summer of the following year a dispute arose between the Japanese North China Garrison Army and the Chinese Twenty-Ninth Army as the result of an incident near the Marco Polo Bridge. The Chinese authorities on the spot accepted proposals for a local settlement, but Chiang Kai-shek appealed to the treaty powers. Meanwhile both sides moved up reinforcements. The outcome of more fighting in the Tientsin area was that an undeclared but murderous war between Japan and China erupted on 13 August in the neighbourhood of the International Settlement at Shanghai. A week later Chiang Kai-shek signed a pact with the Soviet Union and was promised early delivery of weapons and ammunition to the value of a hundred million Chinese dollars.

Thereafter the Western Powers and the Soviet Union vied with each other in supplying Chiang Kai-shek with arms and credits. The Japanese continued to build up their naval and army air forces and tried repeatedly to induce the Western Powers to cut off supplies by making life difficult for their nationals resident in China. The Americans retaliated by denouncing their commercial treaty with Japan.

Before the abrogation of the treaty became effective, the Japanese were staggered by the news that Germany had signed a pact with the Soviet Union. In the meantime clashes with Soviet troops in disputed territory near the frontiers between Manchukuo, Siberia, and Outer Mongolia convinced them that Russia's armed forces were more formidable than they had supposed. They were particularly impressed by the Tupolev SB–2 bomber, already met over

China and almost as fast as the Nakajima Ki–27 fighter.

The conclusion reached by a new government which took office just as the Second World War began was that Japan must at all costs avoid war with Russia and improve her relations with the Western Powers. At the same time she must continue to expand her aircraft industry and build up her naval and army air forces.

But that was before Hitler's armies swept through Western Europe. In the summer of 1940 a new Japanese government saw things rather differently. After the fall of France, Britain seemed so close to defeat that an unashamedly pro-German Foreign Minister, Yosuke Matsuoka, was able to persuade his colleagues and the Privy Council to sanction a Tripartite Pact with Germany and Italy, on the understanding that Japan was to receive a large slice of the British Empire in return for her promise to do all she could to keep the United States out of the war. Almost simultaneously, the French authorities in Indo-China conceded to Japan the right to use the northern part of the country as a base for operations against Chiang Kai-shek.

Matsuoka then tried to transform the Tripartite Pact into a four-power pact with Soviet Russia as the fourth party. The most he could obtain from the Russians was their signature to a bilateral pact which they dishonoured as soon as it suited them to declare war on Japan.

Meanwhile the Japanese faced a slow decline in their reserves of fuel oil as a result of restrictions on exports imposed by the United States. After trying in vain to persuade the Dutch to sell them large quantities of oil from the Netherlands East Indies, they decided in the summer of 1941 to occupy bases in southern Indo-China from which an invasion of the Netherlands East Indies could be launched if the need arose. They came to the conclusion at a high-level conference on 2 July that these bases must be occupied even at the risk of war with Britain and the United States, but barely a fortnight later forced Matsuoka out of office as the prelude to a renewed attempt to restore friendly relations with those countries.

On the initiative of the Americans, Britain and the United States responded to the new situation in Indo-China by putting an embargo on commercial and financial transactions with Japan and persuading the Dutch to follow suit. The Japanese were thus deprived at a stroke of three-quarters of their foreign trade and nine-tenths of their supplies of oil. Their naval and military staffs began, for the first time, to base their plans on the assumption that hostilities might begin before the end of the year, but the government redoubled its efforts to negotiate a peaceful settlement.

Japan goes to War

The negotiations were conducted on behalf of the Western democracies by the American Secretary of State, Cordell Hull. He told the Japanese on 18 November that public opinion in the United States would not tolerate a comprehensive settlement of the Far Eastern question as long as they adhered to the Tripartite Pact. They therefore proposed on 20 November an interim agreement whose terms should, they suggested, include the lifting of the embargo and withdrawal of their forces from southern Indo-China. They also asked for a free hand to make peace with Chiang Kai-shek and for help in bargaining with the Dutch for raw materials.

These terms were unacceptable because the Americans were not prepared to give Japan a free hand in China or allow her to buy more oil than she needed for civilian purposes. Counter-proposals were drafted by the State Department and discussed with representatives of the Australian, Chinese, Dutch, and United Kingdom governments. But they were not shown to the Japanese. On 26 November, Cordell Hull told the Japanese envoys in Washington that their proposals for an interim agreement were unacceptable, withheld the counter-proposals, and gave Japan a virtual ultimatum by demanding the withdrawal of her armed forces from all parts of China and Indo-China. He forgot to add that this was not meant to apply to Manchukuo.

The Japanese government and service chiefs agreed on the following day that this was too big a price to pay for a a new commercial treaty and other benefits offered by Hull. At a conference attended by the Emperor on 1 December Japan formally decided to go to war on the ground that her national existence was at stake.

The result was that hostilities began at a very bad moment for the Western Powers. The Americans were struggling to make the Philippines defensible by sending B–17 bombers there as fast as they could be prepared for service and bases be developed for them. The British had scarcely begun to form the Eastern Fleet by which they

hoped to gain control of the South China Sea and thus protect the Malay peninsula and the Indonesian archipelago from invasion. Neither expected to be ready before the spring of 1942. For the Japanese, on the other hand, a December deadline meant that they could strike before serious inroads were made on their oil reserves and before the south-east monsoon in the South China Sea and winter gales in the North Pacific reached their full force. Furthermore, the Russians would be less likely to stab them in the back if they launched their southward drive when Siberia and Manchukuo were snowbound.

The Japanese Plan

Japan went to war in 1941 for the oil, rubber, tin, and bauxite of South-East Asia and the South-West Pacific. Her most urgent need was to gain access to the oilfields of Sumatra. But she could not afford to send her troops straight to the Netherlands East Indies at the cost of leaving their flanks uncovered. She would begin, therefore, by overcoming the British and American garrisons of Malaya and the Philippines, eliminating the British outpost at Hong Kong and seizing Borneo. A three-pronged advance to the Indonesian archipelago would then be made by way of the Molucca Passage, the Makassar Strait, and the South China Sea. Ultimately Japanese forces would advance to a line running from the frontier between India and Burma through the Adaman and Nicobar Islands to Christmas Island, from Christmas Island through New Guinea and the northern Solomons to the Gilbert Islands, and thence by way of Wake Island to the Kurile Islands. Japanese experts believed that, if that line could be strongly held, the Western Powers might be willing to leave the invaders in possession of their conquests rather than go to the trouble and expense of turning them out.

Forces and Tasks

The combatant troops at the disposal of the Japanese Army in December 1941 consisted of fifty-one divisions of all arms, a cavalry group, and five air divisions. These were supplemented by fifty-nine independent mixed brigades or similar formations, not all of them suitable for an offensive role. Forty divisions and three air divisions were needed to fight Chiang Kai-shek and provide for the security of Japan, Korea, Manchukuo, and occupied China. So only eleven divisions, two air divisions, and a number of independent formations of approximately brigade strength were available for the capture of Hong Kong, Malaya, Burma, the Philippines, Borneo, and the Netherlands East Indies, to say nothing of parts of New Guinea and the Solomons and other places to be held as outpost positions. It followed that the offensive would have to be delivered in stages so that the same troops and air formations could be used successively in different areas. Even then, not nearly enough of either would be forthcoming unless the navy made substantial contributions.

The Japanese naval authorities, traditionally well disposed towards Britain and the United States, had always disliked the pro-German policy which led to the Tripartite Pact. They distrusted the Russians and had little faith in the Russo-Japanese pact of 1941. Nevertheless they were willing, if war had to come, to play their part not merely by looking after the naval side of the offensive, but by providing landing parties for the capture of outlying territories and by devoting most of their land-based Eleventh Air Fleet to tasks which would have been performed by military aircraft if the Army Air Force had been stronger. They were also willing to risk the loss of part of their carrier force in an attempt to cripple or destroy the United States Pacific Fleet at the outset of hostilities. Far away at Pearl Harbor in the Hawaiian Islands, the United States Pacific Fleet would not be able to make any direct contribution to the defence of Hong Kong, Malaya, Borneo, or the Philippines. But Japanese naval strategists accepted the axiom that a fleet in being was an asset of which the enemy ought, if possible, to be deprived.

The British had shown, by crippling the Italian battlefleet at Taranto in November 1940, that carrier-borne torpedo-bombers could be used effectively against warships in shallow water. The Japanese Naval Staff began early in 1941 to study the feasibility of a similar but far more ambitious attack on the powerful American fleet which had moved from the continental United States to Pearl Harbor in the previous summer. In September naval airmen began practising with specially modified torpedoes and armour-piercing bombs. A war game suggested that the attempt might cost Japan two carriers, but the project was approved in principle early in November.

The air forces available for offensive operations on the outbreak of war, and the tasks allotted to them, were as follows:

ARMY AIR FORCE

3rd Air Division
The 3rd Air Division, some 400 aircraft strong, was equipped with Nakajima Ki–27 and Ki–43 fighters, Mitsubishi Ki–51 ground-attack and tactical reconnaissance aircraft, Mitsubishi Ki–30 and Kawasaki Ki–48 light bombers, Mitsubishi Ki–21–II heavy bombers, and Mitsubishi Ki–15 and Ki–46 strategic reconnaissance aircraft. Its task was to support the invasion of Malaya and the capture of Singapore, British Borneo, and northern Sumatra by the Twenty-Fifth Army (5th, 18th, and 56th Divisions and Imperial Guards Division).

5th Air Division
The 5th Air Division, with some 300 aircraft, was equipped with Nakajima Ki–27 fighters, Mitsubishi Ki–51 ground-attack and tactical reconnaissance aircraft, Tachikawa Ki–36 army co-operation aircraft, Mitsubishi Ki–30 and Kawasaki Ki–48 light bombers, Mitsubishi Ki–21–II heavy bombers, and Mitsubishi Ki–15 strategic reconnaissance aircraft. It also had a squadron of Mitsubishi Ki–57 transport aircraft. On the outbreak of war the greater part of the division was to provide cover and support for the invasion of the Philippines by the Fourteenth Army (16th and 48th Divisions and attached troops). After the capture of Manila it was to move to South-East Asia and support an advance from Siam into Burma by the Fifteenth Army (33rd and 55th Divisions). The 45th Air Regiment, detached from the main body of the division and equipped with some eighty aircraft, was to provide cover and support for the capture of Hong Kong by the 38th Division and attached troops.

NAVAL AIR FORCE

First Air Fleet
The First Air Fleet consisted of some 550 aircraft embarked in six fleet carriers and three light fleet carriers. The carrier force was organized as follows:
1st Carrier Squadron (fleet carriers)
Akagi (36,600 tons, 30 knots, 63–72 aircraft)
Kaga (36,000 tons, 30 knots, 63–72 aircraft)
2nd Carrier Squadron (fleet carriers)
Soryu (18,500 tons, 33 knots, 63–72 aircraft)
Hiryu (18,000 tons, 33 knots, 63–72 aircraft)
3rd Carrier Squadron (light fleet carriers)
Hosho (7,470 tons, 25 knots, 21 aircraft)
Zuiho (13,000 tons, 26 knots, 31 aircraft)
4th Carrier Squadron (light fleet carriers)
Ryujo (8,500 tons, 31 knots, 31 aircraft)
Shoho (due for completion January 1942) (13,000 tons, 26 knots, 31 aircraft)
5th Carrier Squadron (fleet carriers)
Zuikaku (25,675 tons, 34 knots, 63–72 aircraft)
Shokaku (25,675 tons, 34 knots, 63–72 aircraft)

On the outbreak of war the 1st, 2nd, and 5th Carrier Squadrons were assigned to a Striking Force commanded by Vice-Admiral C. Nagumo. The authorized establishments of the units embarked in the six fleet carriers provided an initial equipment of 108 A6M2 fighters, 126 D3A1 dive-bombers, and 144 B5N2 attack-bombers, or a total of 432 aircraft with immediate reserves. The task assigned to the Striking Force was to destroy or cripple the United States Pacific Fleet at Pearl Harbor and destroy aircraft at neighbouring airfields.

When hostilities began, the 3rd Carrier Squadron was attached to the Combined Fleet for training and was in process of re-equipment with new aircraft. The 4th Carrier Squadron was assigned to Vice-Admiral N. Kondo's Southern Force, whose task was to provide cover and support for operations by the Fourteenth, Fifteenth, Sixteenth, and Twenty-Fifth Armies, which together formed the Southern Area Army. The squadron's only carrier, the *Ryujo*, was to be joined by the *Shoho* when she was ready.

Eleventh Air Fleet
The Eleventh Air Fleet consisted of the 21st, 22nd, and 23rd Air Flotillas and a Special Seaplane Tender Detachment.

The task of the 21st and 23rd Air Flotillas was to assist the Fourteenth Army and the 5th Air Division by striking from bases in Formosa at objectives in the Philippines, and later to move to the Philippines for the purpose of providing cover and support for the capture of Dutch Borneo, Celebes, Amboina, Timor, Java, and southern Sumatra by the Sixteenth Army (2nd Division and headquarters troops, to be reinforced after the capture of Hong Kong and Manila by the 38th and 48th Divisions and an additional infantry regiment from the Fourteenth Army). The 21st Air Flotilla was equipped with 120 G4M1 land-based long-range bombers (less 42 attached to the 22nd Air Flotilla) and 24 H6K flying-boats. The 23rd Air Flotilla had nearly 200 land-based A6M2 fighters, about 70 G3M2 land-based long-range bombers, and 24 C5M2 land-based strategic reconnaissance aircraft.

The task assigned to the 22nd Air Flotilla was to supplement the support given by the 3rd Air Division to the Twenty-Fifth Army in Malaya, British Borneo, and northern Sumatra. Its 90 G3M2 bombers were augmented by 42 G4M1s borrowed from the 21st Air Flotilla, and it was given a special detachment of 36 A6M2 fighters and 6 C5M2 strategic reconnaissance aircraft, all land based.

The Special Seaplane Tender Detachment consisted of the seaplane tenders *Mitzuho* and *Chitose*, each with twenty aircraft. Its task was to contribute to the invasion of Malaya by keeping watch for submarines which might approach transports carrying the Twenty-Fifth Army's troops.

24th Air Flotilla
The 24th Air Flotilla, with an initial equipment of 36 G3M2 land-based long-range bombers and 24 H6K flying-boats, was stationed in the mandated islands as part of Vice-Admiral S. Inouye's South Seas Force. The tasks assigned to it were to deliver softening-up attacks on Guam, Wake Island, and Makin and Tarawa in the Gilbert Islands, and after the return of the Striking Force from Pearl Harbor to co-operate with the First Air Fleet in providing cover and support for landings in New Guinea and the Bismarck archipelago by naval parties and a regiment detached from the 55th Division.

Miscellaneous Naval Air Units
Other naval aircraft available for offensive operations included some 400 to 500 seaplanes on the establishments of units at the disposal of commanders of seagoing fleets, squadrons, or flotillas or naval establishments ashore. To this category belonged seaplanes carried as spotters by battleships and cruisers.

Pearl Harbor and the Philippines

Admiral Nagumo left Hitokappu Bay in the Kurile Islands on 26 November 1941, with orders to proceed by a northerly route to a point about 275 miles north of Pearl Harbor. He was told that he would be recalled if negotiations still proceeding in Washington were successful, and in any case was to turn back if he judged that surprise had been lost. In addition to eight tankers and three submarines, his force consisted of the 1st, 2nd, and 5th Carrier Squadrons, two fast battleships of the 3rd Battle Squadron, two heavy cruisers of the 8th Cruiser Squadron, and a destroyer flotilla led by a light cruiser.

A signal transmitted on 2 December told Nagumo that there would be no recall, but left him still free to turn back if he thought it expedient to do so. He reached his flying-off position before dawn on Sunday, 7 December, despatched four seaplanes to reconnoitre the target area, and decided in the light of the information they transmitted to send 353 aircraft to Pearl Harbor and its neighbourhood in two waves. Two American radar operators detected one of the seaplanes at 6.45 a.m. and tracked it for fifteen minutes. The information centre to which they reported then closed down.

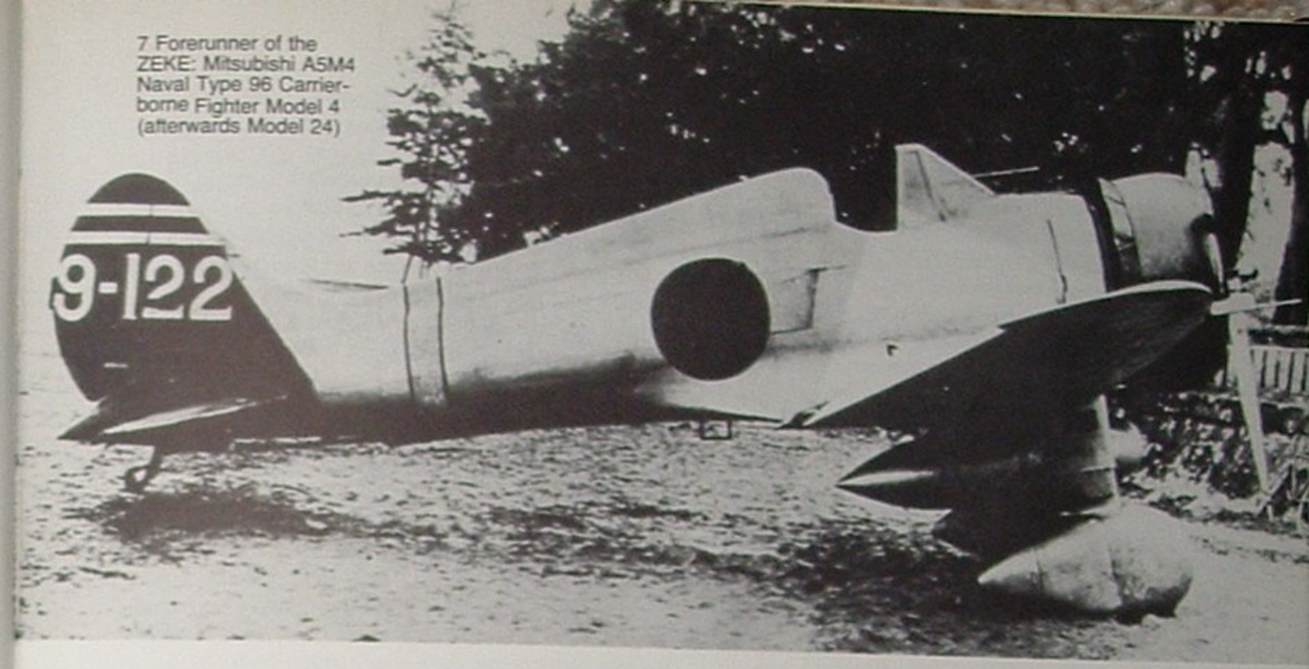
Commander Mitsuo Fuchida led the first wave of 183 A6M2s, D3A1s, and B5N2s. The same radar operators, having decided to go on manning their set until a truck arrived to take them to breakfast, detected his force some forty minutes before it arrived, but they failed to persuade anyone in authority to take their warning seriously. No American fighters were airborne when Fuchida reached the island, and very few anti-aircraft guns ashore or afloat were fully manned. Of seven battleships berthed close together south-east of Ford Island, three were hit by torpedoes in the first few minutes. Within half an hour one was a blazing wreck, one had capsized, one had settled on the bottom, and a fourth was sinking. The three still afloat were more or less severely damaged. An eighth battleship, in dry dock, was hit by a bomb dropped from an aircraft of the second wave, but suffered no great damage. For the loss of twenty-nine of their own aircraft the Japanese sank or damaged eighteen American warships or auxiliaries, destroyed or damaged 349 American aircraft, and killed or wounded 3,581 American sailors, soldiers, or marines. About a hundred civilians, most of them employed at naval or military establishments, were killed or injured.

Even so, Nagumo did not succeed in eliminating the United States Pacific Fleet. The carriers *Lexington*, *Saratoga*, and *Enterprise* – each of them more valuable than any battleship – were absent at the time of the attack, as was the battleship *Colorado*. Nor did Nagumo eliminate Pearl Harbor as a naval base. Naval installations ashore came to little harm. Repair shops were left almost unscathed, reserves of fuel untouched. The Americans were able to go on using Pearl Harbor as their only first-class naval base west of the continental United States, and even to restore many of their damaged ships to service. Only one of the eight battleships hit on 7 December became a total loss. Of the remaining seven, four had to be refloated, but eventually all rejoined the fleet except one that was sold for scrap.

Japanese Air Superiority

The Pearl Harbor attack began at 7.55 a.m. on Sunday, 7 December, by Hawaiian time. The time at Manila was 1.55 a.m. on Monday, 8 December. The Japanese, recognizing that news of the holocaust at Pearl Harbor was bound to reach the Philippines before the sun rose in the South-West Pacific, hoped that nevertheless aircraft despatched from Formosa at first light would be able to bomb airfields in Luzon before the Americans had time to move their own aircraft out of harm's way. Their plan was that the 5th Air Division should deal with airfields in the northern part of the island while the 21st and 23rd Air Flotillas, using aircraft of longer range, took care of those near Manila.

To their utter dismay, thick fog over Formosan airfields in the early part of the day made havoc of this plan. Except for the shooting-up of a seaplane tender off Davao by A5M4 fighters from the *Ryujo*, no air attacks on objectives in the Philippines were made before 9.30 a.m., when the 5th Air Division arrived three hours late to bomb the objectives assigned to it in northern Luzon. Aircraft of the 21st and 23rd Air Flotillas did not reach the neighbourhood of Manila until after midday. Their crews were amazed to find that, although the Americans must have known for many hours that air attacks were likely to be made at almost any moment, they had not only omitted, or been unable, to move their aircraft to safer quarters



7 Forerunner of the ZEKE: Mitsubishi A5M4 Naval Type 96 Carrier-borne Fighter Model 4 (afterwards Model 24)

but had left most of them parked close together in neat rows. For the loss of only seven of their own aircraft, the Japanese destroyed nearly a hundred American bombers and fighters, including very nearly the whole of the one fighter squadron that was airborne when they arrived.

These losses reduced the number of aircraft of the United States Army Air Corps available for the defence of the Philippines to seventeen heavy bombers and fewer than forty fighters, not all of them undamaged. After another foggy day, the 21st and 23rd Air Flotillas returned on 10 December to deal with the American naval base at Cavite. Using roughly a hundred A6M2 fighters to provide escort and cover for fifty to sixty bombers, they had little difficulty in beating off attacks by the thirty-five fighters that were all the Americans could muster. Their bombs started uncontrollable fires in the Navy Yard, destroyed the entire reserve stock of torpedoes for the submarines of the United States Asiatic Fleet, and wrecked a large part of the town. Two days later A6M2 fighters destroyed an entire wing of Catalina flying-boats as it was returning from a fruitless search for Nagumo's carriers. Surviving American naval aircraft then withdrew to Java, leaving the Japanese with almost undisputed control of the sea and air approaches to the Philippines. On 3 January 1942, after the defenders of Luzon had withdrawn to fight a rearguard action in the Bataan peninsula, the Fourteenth Army occupied Manila without opposition.

Malaya, Hong Kong, British Borneo

The Japanese assigned to the conquest of Malaya, British Borneo, and northern Sumatra their best troops and some 560 first-line aircraft. The British had calculated in 1940 that, in the absence of a strong fleet, they would need 582 aircraft to provide an adequate defence for the Malay peninsula, British Borneo, and shipping in adjacent waters. In December 1941 they had 158.

More than an hour before the first torpedoes were launched and the first bombs dropped at Pearl Harbor, three Japanese transports anchored off Kota Bharu, in northern Malaya. Soon afterwards landing craft began to put troops of the 56th Infantry Regiment ashore. The time in Malaya was 12.45 a.m. on Monday, 8 December.

The British suspected, rightly, that this was a subsidiary landing and that the main landings would be made at Singora and Patani, in Siam, since these were the places from which an invading force could most easily gain access to the road and railway that crossed the isthmus of Kra and ran down the west coast of Malaya. Nevertheless they sent aircraft to attack the transports by moonlight, and ordered an all-out air attack at dawn. All three transports were damaged and withdrew northwards. The aircraft despatched at dawn, finding little or nothing to attack at Kota Bharu, landed at airfields in

northern Malaya to refuel and rearm. The result was that many of them were caught on the ground by bombers of the 22nd Air Flotilla which had left southern Indo-China at first light.

In the meantime about seventeen bombers of the 22nd Air Flotilla attempted a moonlight raid on airfields near Singapore. Most of their bombs fell in the built-up area of the town.

By 9 December the Japanese were firmly established at Singora, where they met little more than token opposition from the Siamese. The British decided to devote most of their surviving bombers to two raids on bases established there by the 3rd Air Division. Just as a formation of Blenheims was about to take off for the second raid, it was caught on the ground by some of the 3rd Air Division's bombers and lost nearly all its aircraft. From that time until the end of the campaign in Malaya the Japanese could count on a numerical superiority in the air of at least ten to one.

Meanwhile the British naval Commander-in-Chief, Admiral Sir Tom Phillips, came to the conclusion that, although he had no carriers and could expect little help from land-based aircraft, he would be justified in risking a surprise attack on any Japanese warships and transports that might be found off Singora and Kota Bharu at dawn on 10 December. His force, called Force Z and consisting of the battleship *Prince of Wales*, the battle-cruiser *Repulse*, and four destroyers, left Singapore towards nightfall on 8 December. Phillips asked for fighter protection off Singora, but a signal transmitted on 9 December told him that it could not be provided. About 1.40 p.m. on that day one of twelve Japanese submarines patrolling off the coast between Kota Bharu and Singapore reported his position, course, and speed. Vice-Admiral Kondo, commanding the Japanese Southern Force, thereupon ordered a cruiser squadron to fly off its observation aircraft and shadow him. Phillips, recognizing when Japanese aircraft were seen that evening from the *Prince of Wales* that he could no longer hope to achieve surprise, reluctantly turned for home. Just before midnight, however, he altered course in order to investigate a report that Japanese troops were landing at Kuantan, on the east coast of Malaya about 175 miles north of Singapore. Not knowing that the 22nd Air Flotilla had been reinforced with C5M2s and G4M1s for the express purpose of locating and sinking his fleet if the opportunity arose, he seems to have reasoned that he was unlikely to be attacked at a point 400 miles from the nearest Japanese naval airfield outside Saigon.

About two hours later a second Japanese submarine reported his course and position. Bombers of the 22nd Air Flotilla which were preparing for a night attack on Singapore exchanged their bombs for torpedoes and went to look for him, but failed to find him. C5M2s which took up the search before daybreak were more successful. About 10.20 a.m. one of them sighted the two British capital ships and directed a striking force of sixty G3M2s and twenty-five G4M1s towards them. Attacks with torpedoes and armour-piercing bombs began about 11.15 a.m. and continued for an hour or more. The *Repulse* sank at 12.33 p.m., the *Prince of Wales* about fifty minutes later. Destroyers rescued more than 2,000 survivors without interference from the Japanese. A squadron of Buffalo fighters left Singapore seven minutes after a signal reporting that the *Repulse* was under attack reached Air Headquarters, but arrived too late to engage the enemy.

Air power thus won for the Japanese complete command of the South China Sea. It also endowed them with a reputation for invincibility which had a marked effect on the readiness of the defenders of Malaya to accept calculated risks. Having lost a chance of forestalling the enemy at Singora for fear of offending the Siamese, the British elected to make their first stand at Jitra, in north-west Malaya. An advanced guard of the Japanese 5th Division attacked them there on 11 and 12 December, but made little progress. Without waiting to be attacked by the main body of the division, the British then abandoned the Jitra position in the belief that their right flank was threatened with encirclement. With troops more or less disorganized by the retreat, they went on to fight a series of expensive delaying actions in the hope of postponing the enemy's arrival at places from which long-range aircraft might strike at convoys bringing supplies and reinforcements to Singapore. When they did attempt a major stand in January, they were unsuccessful because an unsound disposition by the commander of an *ad hoc* force enabled the Japanese to outflank their main position.

At the end of January the British withdrew to Singapore Island. Divided from the mainland only by a narrow channel fringed with mangrove swamps, the island was not the fortress that armchair strategists in London believed it to be. Three of its four airfields could be swept by observed fire from the mainland. The Japanese had no advantage in numbers so far as land forces were concerned, but their overwhelming air superiority put them in a strong position. After artillery and air bombardments extending over several days, they had little difficulty in crossing the channel under cover of darkness and establishing themselves in a corner of the island where bombs or shells had cut all telephone lines between front and rear. Mistakes and misunderstandings led the British to withdraw after a few days to their last line of defence covering Singapore town. Most of the built-up area then became a legitimate target for Japanese gunners and bomber crews. Bombing and shelling caused heavy civilian casualties, blocked streets with rubble, and fractured water-mains. By 13 February armed deserters, chiefly from administrative units or newly-arrived drafts, were reported to be hiding in the town, seizing small boats or forcing their way aboard ships about to leave for Java or Sumatra. Two days later stocks of food for the troops, of ammunition for field and anti-aircraft guns, and of fuel for military vehicles were running low, or in some cases were already exhausted. The municipal authorities reported that so much water had leaked away through fractured mains that the supply was not expected to last more than another twenty-four hours. A total stoppage, they said, might have appalling consequences in a town crammed with refugees. In the light of this report, and of the unanimous opinion of corps and divisional commanders that an attempt to recapture dumps outside the town could not succeed, the British Commander-in-Chief surrendered that evening on terms which allowed 1,000 of his men to retain their arms as long as their services were needed to maintain or restore law and order.

Fall of Hong Kong and North Borneo

In 1941 Hong Kong had long been regarded by the British military authorities at home as an outpost which could be only briefly held in the event of war. Shortly before the outbreak of war its garrison was increased from four to six battalions in the hope that a rather longer stand than had previously been contemplated might be possible, but the naval and air forces available for the defence of the whole of the Crown Colony when hostilities began on 8 December 1941 consisted only of one destroyer, eight motor torpedo boats, four gunboats, some armed patrol vessels, three obsolete torpedo-bombers, and two Walrus amphibians. All five of these aircraft were destroyed by the 45th Air Regiment's escorted bombers at the outset of the war, as were eight civilian aircraft. At the end of a week the only British naval vessels still afloat were two gunboats and some of the motor torpedo boats and patrol craft.

By the morning of 13 December the garrison completed the withdrawal of its land forces from Kowloon and the Leased Territories to Hong Kong Island. During the next few days artillery and air bombardments knocked out pillboxes and searchlight posts, cut telephone lines at a number of points, and started uncontrollable fires in built-up areas. Late on 18 December the assault troops of three Japanese infantry regiments succeeded in crossing to the island under cover of darkness and the smoke from oil tanks and a factory set alight by bombing or shelling. By the evening of 23 December nine battalions were ashore. Thereafter almost incessant artillery and mortar fire, accompanied by low-level air attacks, reduced the defenders to such straits that two days later the British surrendered without terms.

British Borneo was even less defensible. With only one infantry battalion, a small Coastal Marine Service and a few native troops and armed police in the whole of British North Borneo, Sarawak, the Brunei Protectorate, and Labuan, the authorities came to the conclusion before hostilities began that the most they could attempt in the event of war, apart from making oil installations more or less useless to the enemy, would be to defend an airfield near Kuching, in western Sarawak, in order to prevent an invader from using it as a stepping-stone towards an airfield in Dutch Borneo which was only 350 miles from Singapore.

The Japanese duly occupied undefended localities in North Borneo about a week after the outbreak of war. An attack on Kuching by fifteen bombers on 19 December did little damage, but made the labour needed to complete the defences of the airfield almost unobtainable. A few days later, the authorities in Singapore decided that the airfield should be destroyed. After carrying out this order just as two battalions of the Japanese 124th Infantry Regiment were preparing to come ashore, the troops at Kuching fought a vigorous defensive action and eventually withdrew into Dutch Borneo.

Dutch Borneo and the Netherlands East Indies

By the end of 1941 things were going so well for the Japanese in Malaya and the Philippines that early in the New Year a start was made with the next stage of their offensive. In the first week of January the 21st Air Flotilla moved to Jolo and the 23rd to Davao. On 7 January, a mixed force left Davao for Tarakan Island, off the north-eastern corner of Dutch Borneo. Air cover provided by the 23rd Air Flotilla did not prevent Java-based American bombers from sighting and attacking the convoy, but no hits were scored. After securing the northern approaches to the Makassar Strait by occupying Tarakan on 12 January, the Central Force of Admiral Kondo's Southern Force went on to gain control of its southern exit by seizing Balikpapan some twelve days later. By the end of January aircraft of the 23rd Air Flotilla were stationed at airfields in south-eastern Borneo. The Eastern Force, moving step by step with the Central Force, and covered by the 21st Air Flotilla, occupied Kema and Menado, in Celebes, in the second week of January, and by the last week in the month was firmly established at Kendari, in the south-eastern corner of the island. The airfield at Kendari then became the chief base of the 21st Air Flotilla. Amboina, on the eastern side of the southern approaches to the Molucca Passage, was seized on 31 January by a naval landing party and elements of the 38th Division, covered by fleet carriers of the 2nd Carrier Squadron. At Menado the Japanese used twenty-eight transport aircraft from Davao to drop 334 paratroops who should have landed on or near the airfield but were in fact widely scattered.

Australia bombed

Once established in Celebes, the Japanese were well placed not only to take a further step towards the Netherlands East Indies by occupying Timor, but also to make the reinforcement of Timor extremely difficult. The case for forestalling the enemy there had been apparent to the Allies before Kendari fell, but because they were at first unable to agree on the steps to be taken, it was not until 15 February that a convoy carrying reinforcements left Darwin in Australia. Soon sighted by the crew of a Japanese seaplane, the convoy was attacked by bombers from Kendari and turned back. On 19 February, less than twenty-four hours after the convoy had returned, Darwin was bombed by carrier-borne aircraft of the First Air Fleet. These were followed by aircraft of the 21st Air Flotilla. Eleven ships were sunk, twenty-three aircraft destroyed and more than five hundred people killed or injured. The Australian authorities, concluding that invasion was imminent, ordered all civilians to leave the town, but their fears were groundless. The Japanese did think of invading Australia, but came to the conclusion that they had no hope of finding either the ten divisions that would have to be devoted to the purpose, or the shipping needed to maintain them.

Almost simultaneously, the Japanese severed the air reinforcement route from Australia to the Netherlands East Indies by seizing Timor. Meanwhile, on 14 and 15 February, Mitsubishi Ki–57 transport aircraft carried about 360 paratroops to the neighbourhood of oil installations at Palembang, in Sumatra. The Allies, although warned of their approach, were unable to intercept them because their fighters were preoccupied with attempts to prevent landings from the sea. Within a few days all points of strategic importance throughout southern Sumatra were in the hands of the Japanese and the Allies withdrew their troops to Java.

The Battle of the Java Sea, which settled the fate of the Netherlands East Indies, followed on 27 February. It was fought between small fleets of approximately equal strength. Neither fleet included carriers, but the Japanese admiral was well provided with cruiser-borne observation aircraft. The Dutch commander of a hastily-assembled Allied force was not. Had he been able to call on the services of a land-based maritime-reconnaissance force capable of keeping him informed of the enemy's movements, the battle might have had a different outcome. As things were, he lost nearly all his fleet in a gallant but vain attempt to seek out and destroy the enemy's transports, which were kept out of harm's way until the battle was over. Outnumbered and outfought on land, the Allies gave up the struggle in Java on 12 March. On the same day, troops of the Imperial Guards Division landed without opposition in northern Sumatra. The Twenty-Fifth Army thus completed, in just over three months, the mission assigned to it in December.

Burma and the Indian Ocean

The campaign in Borneo, Celebes, and the Indonesian archipelago, accompanied by the seizure of lightly-garrisoned objectives in Papua, New Britain, and New Ireland, was the last of a series in which the Japanese naval and military air forces were almost uniformly successful. But not quite. The Army Air Force had already suffered a setback in Burma, where daylight raids on Rangoon had to be suspended in face of losses inflicted on the 5th Air Division's bomber force by one American and one British fighter squadron. In the outcome the Japanese were never able to assert unchallenged control of the air in Burma. They began by forcing the Burma Army to make a spectacular retreat to the Indian frontier, but later in the war the British turned the tables on them by allowing their troops to be enveloped and supplying them by air. At the Ngakyedauk Pass and Imphal in 1944 it was not the encircled British but the encircling Japanese who ran out of supplies and had to accept defeat.

The Japanese Naval Air Force first fell short of the complete success to which its leaders had become accustomed when, in 1942, Admiral Nagumo took five of his carriers into the Indian Ocean with the intention of repeating at Colombo and Trincomalee the havoc he had wrought at Darwin and Pearl Harbor. He hoped that, by attacking Colombo on 5 April – which was Easter Sunday – he might provide himself with an opportunity of destroying the new Eastern Fleet assembled by the British since the loss of the *Prince of Wales* and the *Repulse*. The Commander-in-Chief of the Eastern Fleet, Sir James Somerville, was forewarned of Nagumo's intention but expected him to arrive a few days earlier than he did. After lying in wait for three days and two nights, he took the better part of his fleet to a new base in the Maldive Islands, of whose existence the Japanese were unaware. By the time Nagumo was seen steering towards Ceylon on 4 April, it was too late for Somerville to intercept him before he reached his flying-off position, but not too late for the defences of Colombo to be brought to readiness or for shipping there to be dispersed. The attack, delivered about 8 a.m. on Sunday, did considerable damage to quays and workshops, but the only vessels sunk were a destroyer which was refitting and an armed merchant cruiser. A submarine depot ship was holed and one merchant ship was hit but suffered little damage. Later in the day about fifty aircraft from the carriers attacked two cruisers detached from Somerville's fleet and sank both of them, but 1,122 officers and ratings out of a total of 1,546 were rescued after spending twenty-eight hours in open boats or on rafts in shark-infested waters.

During the afternoon of 5 April Nagumo made off to the south-east to escape interception by Somerville's force. On 8 April he was seen heading back towards Ceylon with the obvious intention of attacking Trincomalee. The harbour was clear of shipping by the time he delivered his attack next morning, but a destroyer, a corvette, a tanker, a fleet auxiliary, and the eighteen-year-old light fleet carrier *Hermes* were found at sea and sunk. Bombing damaged the dockyard and a neighbouring airfield, but both at Trincomalee and at Colombo casualties were much lighter than at Darwin or Pearl Harbor.

A commerce raid by a force commanded by Vice-Admiral J. Ozawa was timed to coincide with Nagumo's venture. Ozawa left Mergui, in Lower Burma, on 1 April with ten cruisers, eleven destroyers, and the *Ryujo*, paused for twenty-four hours in the channel between the Andaman and Nicobar Islands, and then set a north-westerly course. On 6 April he sank about 92,000 tons of merchant shipping off the coast of Madras and his aircraft dropped bombs at two places ashore, doing little damage but giving the inhabitants a great fright. He then made off towards the Malacca Strait, content to have caused so much alarm and confusion that for some time traffic in and out of Calcutta was almost at a standstill.

New Guinea, the Solomons, and Strategic Overstretch

By the middle of March 1942, the Japanese were firmly established in Malaya, Borneo, the Philippines, the whole of the Indonesian archipelago, and Burma as far north as Rangoon. All the islands of the Pacific north of the equator and as far east as Wake, Makin, and Tarawa were in their hands. In New Guinea and the Bismarck archipelago they held Salamaua, Lae, and Finchshafen in the Huon Peninsula, Gasmata and Rabaul in New Britain, and

Kavieng in New Ireland. When, later in the month, elements of the South Seas Force supported by the 24th Air Flotilla took possession of Bougainville, Buka, and Shortland Island in the northern Solomons, all that was needed to round off the programme of conquest sketched in 1941 was that the Fifteenth Army in Burma should complete its advance to the Indian frontier.

All this was highly satisfactory from the point of view of the Japanese Supreme Command. The fact remained that the First Air Fleet, notwithstanding its brilliant performance at Pearl Harbor, had failed to eliminate the United States Pacific Fleet as a factor in the war. As long as the Americans had a fleet in being and access to air staging posts in the Central Pacific and the Antipodes, Japanese forces in the South-West Pacific would have to reckon with the possibility of a counter-offensive from Australia, nourished by American supplies. As early as January the Japanese Naval Staff had come to the conclusion that Port Moresby, on the Gulf of Papua, should be captured as the prelude to a possible advance to New Caledonia, Fiji, and Samoa. Plans for the invasion of Ceylon were rejected by both the army and the navy on the ground that the time was not ripe for so ambitious a venture and that the requisite forces were not available. Admiral Yamamoto insisted that priority should be given to an attempt to bring surviving warships of the United States Pacific Fleet to action and so destroy them. An expedition to Midway Island, north-west of the Hawaiian Islands and close to the international date-line, was planned with that purpose in view.

Such was the state of Japanese thinking about the middle of April. The Americans then introduced a new factor by using B–25 army bombers embarked in the newly-commissioned *Hornet* to attack Tokyo, Osaka, Kobe, and Nagoya. No more bombs were to fall on the Japanese homeland for a long time to come, but the effects on morale were considerable. Alarmed and confused but still inclined to regard their armed forces as invincible, the Japanese authorities decided to proceed with their plans for expeditions to Port Moresby and Midway Island and then review the outlook.

8 The *Lexington* attacked by dive-bombers and torpedo-bombers during the Battle of the Coral Sea

The Battle of the Coral Sea

The Japanese troops intended for the invasion of Port Moresby embarked in eleven transports escorted by six destroyers. A twelfth transport, with its own escort of two destroyers, carried a naval party which had orders to establish a seaplane base at Tulagi, in the British Solomon Islands Protectorate. The light fleet carrier *Shoho*, a seaplane carrier, four heavy and two light cruisers, one destroyer, and three gunboats were to provide cover and support. The intention was that, once the naval party was safely ashore at Tulagi, the remaining transports and the covering and support forces should proceed to Port Moresby by way of the Jomard Passage, between the south-eastern extremity of New Guinea and the Louisiade archipelago.

The Japanese estimated the naval and air forces that might be used against them at perhaps 200 land-based bombers from Queensland and one fleet carrier. They therefore formed a Carrier Striking Force consisting of the fleet carriers *Zuikaku* and *Shokaku*, two heavy cruisers, and six destroyers. This was to enter the Coral Sea by rounding the south-eastern extremity of the Solomon Islands. The idea was that, after dealing with any Allied warships that might appear, the force should proceed to a point about 400 miles from the east coast of Australia and send aircraft to attack Allied airfields at Townsville, Cooktown, and Horn Island. In addition to 125 aircraft carried by the *Zuikaku* and the *Shokaku* and twenty-one by the *Shoho*, the Japanese would be able to call on roughly 160 land-based aircraft stationed in the Bismarck archipelago or at airfields from which they could move there at short notice.

The Japanese estimate of the number of Allied bombers in Queensland was correct. On paper the Allies also had about fifty fighters there, another fifty at Port Moresby, and not far short of 200 at Sydney and Darwin. Serviceable strengths were substantially lower. However, when the American naval authorities learned from their intelligence sources about the middle of April that a heavily-escorted Japanese force was due to enter the Coral Sea early in May and that the *Zuikaku* and the *Shokaku* were under orders to proceed to the Caroline Islands after their return from the Indian Ocean, they adopted a plan which relied only to a small extent on land-based aircraft. The gist of it was that a task force consisting of the *Yorktown*, the *Lexington*, eight cruisers, thirteen destroyers, and a seaplane tender, the whole under the command of Rear-Admiral F. J. Fletcher, should assemble in the Coral Sea at the beginning of May. The force included an Australian cruiser squadron under a British commander, Rear-Admiral J. G. Crace.

Fletcher was 400 miles south of Guadalcanal when he learned at nightfall on 3 May that earlier in the day airmen on reconnaissance had seen a Japanese force disembarking at Tulagi. He hastened in that direction and next morning sent aircraft to attack any shipping they could find. By that time the Japanese support force had left to rejoin the ships bound for Port Moresby, and the covering force was on its way to Shortland Island to refuel. On 5 May, the covering force was reunited with the invasion and support forces, and that night the Carrier Striking Force entered the Coral Sea.

Loss of the *Shoho*

Fletcher spent much of 6 May refuelling and searching for the enemy. Eventually he came to the conclusion that the invasion force would approach by way of the Jomard Passage. Next morning, fearing that he might not arrive in time to intercept it, he sent Crace ahead of him to keep watch. Without air cover and attacked by waves of land-based aircraft, Crace managed to reach the southern exit of the Jomard Passage without losing any ships, but saw nothing of the invasion force because Admiral Inouye, who was in command of the whole enterprise and had learnt from his airmen of Fletcher's whereabouts, had ruled in the meantime that the invasion, covering and support forces should stay well out of the way until further notice.

About the time when Crace took leave of Fletcher, the pilot of an aircraft from the *Yorktown* saw light cruisers and gunboats of the Japanese support force and reported them as two heavy cruisers and two destroyers. As the result of a ciphering error, Fletcher was told that two carriers and four heavy cruisers had been seen. He sent about ninety of his 141 carrier-borne aircraft to attack them. By sheer chance, they found and sank the *Shoho*.

Still without a clear picture of the enemy's dispositions, Fletcher decided later in the day to make for Port Moresby during the night and rely on land-based aircraft to locate the *Zuikaku* and the *Shokaku* for him as soon as daylight returned. But he changed his mind when Japanese aircraft, displaying recognition signals,

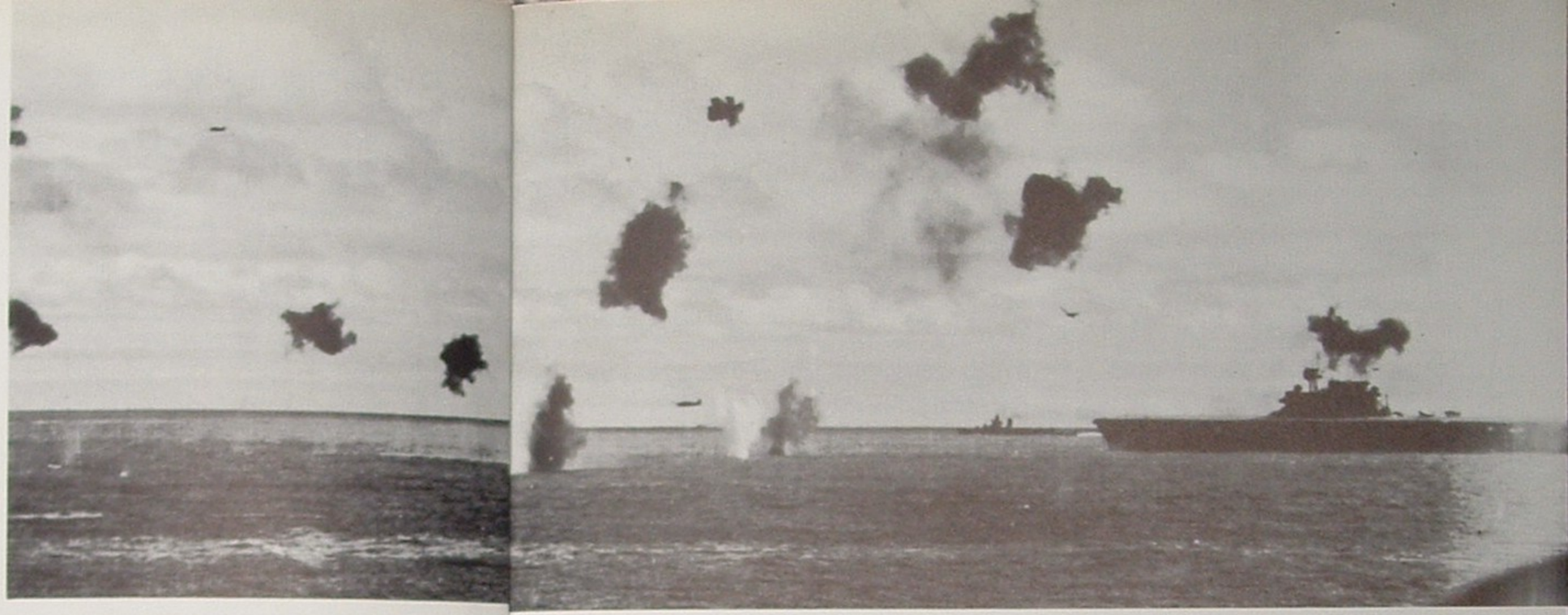
approached the *Yorktown* soon after sunset. Concluding that the *Zuikaku* and the *Shokaku* could not be far away, and rejecting the idea of a night attack with cruisers and destroyers as too risky, he then decided to keep his force concentrated and prepare for action in the morning. The Japanese, too, weighed the arguments for and against a night attack and came to a similar conclusion.

The Japanese withdraw

Early on 8 May, after both sides had reconnoitred at first light, the Japanese and the Americans despatched their striking forces almost simultaneously. When the first wave of torpedo-bombers and dive-bombers from the *Yorktown* approached the Japanese carriers, the *Zuikaku* disappeared in a rain-squall and the *Shokaku* turned into the wind to launch defensive fighters. All but two of the American aircraft then attacked the *Shokaku*. The torpedo-bombers were unsuccessful, but the dive-bombers scored hits which buckled the *Shokaku*'s flight deck so that she could no longer launch aircraft, although she could still recover them. Follow-up aircraft from the *Lexington* scored only one hit. The *Shokaku*, burning furiously but not irreparably damaged, made off after arrangements had been made for some of her aircraft to be transferred to the *Zuikaku*.

Almost at the same moment, the two American carriers were attacked by the aircraft which had left the *Zuikaku* and the *Shokaku* earlier. The *Yorktown* dodged the enemy's torpedoes but was hit by one bomb which did not disable her. The *Lexington* was hit by two torpedoes and three bombs, caught fire and developed a list. The fires were brought under control and she was righted, but some hours later an explosion caused by an accumulation of petrol vapour damaged her so badly that she had to be abandoned and sunk by her own side. Both fleets withdrew from the Coral Sea, and the Port Moresby invasion force returned to Rabaul without ever attempting the Jomard Passage.

So ended the first naval battle in which no shots were exchanged between ships, all the losses on both sides being inflicted by carrier-borne aircraft. Apart from a destroyer and some small craft sunk, the Japanese lost the *Shoho* and fought their next battle without the *Shokaku* and her sister-ship the *Zuikaku*. The Americans lost the *Lexington*, a destroyer, and a tanker, but gained a strategic victory by averting the threat to Port Moresby.



The Battle of Midway Island

Before the Battle of the Coral Sea was over, the American naval authorities were warned by their intelligence sources of impending moves which led to the decisive Battle of Midway Island.

The intention of the Japanese naval and military authorities was to set a trap for the Allies by making diversionary landings at Attu, Kiska, and Adak, in the western Aleutians, under cover of attacks on more valuable objectives in the eastern Aleutians by aircraft from the light fleet carrier *Ryujo* and the newly-completed 24,140-ton fleet carrier *Junyo*. An Aleutian Support Force of four battleships and two light cruisers was to take up a position about half-way between Pearl Harbor and the western Aleutians and engage any Allied warships moving in either direction.

While the Americans were thus preoccupied, twelve transports were to carry about 5,000 men and their supplies to Midway Island and disembark them after softening-up attacks had been delivered by Admiral Nagumo's Striking Force, renamed the First Mobile Fleet and now consisting of the *Akagi*, the *Kaga*, the *Soryu* and the *Hiryu*, with 272 aircraft. The transports were to be escorted by a light cruiser and thirteen destroyers and would be covered and supported by two battleships, eight heavy cruisers, ten destroyers, and the light fleet carrier *Zuiho*, with twenty-three aircraft. Any Allied warships which did not succumb to the Aleutian Support Force were to be brought to action and destroyed by the First Mobile Fleet and the main body of the Combined Fleet, consisting of three battleships, the light fleet carrier *Hosho*, thirteen destroyers, and two seaplane carriers laden with motor torpedo boats and midget submarines. Apart from a minesweeping force and a number of tankers, other ships the Japanese proposed to use included two lightly escorted seaplane carriers with twenty-eight seaplanes.

Midway: the First Phase

This was an ambitious plan which might have worked if the Americans had not known what to expect. Aware, in the light of intercepted signals, of the threat to Midway Island, their naval Commander-in-Chief Admiral Nimitz assigned to the defence of the Aleutians only a small cruiser and destroyer force under Rear-Admiral Robert A. Theobald. This was supplemented by roughly 170 land-based aircraft. Believing that the information which pointed to landings in the western Aleutians might be spurious, and reluctant to uncover the approaches to the eastern Aleutians and Alaska, Admiral Theobald moved too late to prevent the Japanese from seizing Attu and Kiska. The landing at Adak was countermanded as a result of developments elsewhere.

For the main battle Nimitz assembled a Carrier Striking Force under Admiral Fletcher. This was in two parts. Task Force 16, under Rear-Admiral Raymond A. Spruance, consisted of the *Enterprise*, the *Hornet*, six cruisers, and nine destroyers. Task Force 17, under Fletcher's direct command, comprised the *Yorktown*, two cruisers, and six destroyers. The American naval authorities, fearing that repairs to the *Shokaku* might be completed in time for the battle and that she and the *Zuikaku* might take part in it, suggested that the British might lend Nimitz a carrier, but none was available. Nimitz did not, however, depend solely on the Carrier Striking Force. Nineteen submarines patrolled the approaches to Midway Island, and roughly 120 land-based aircraft or flying-boats were stationed there. About a dozen light naval craft and a reinforced battalion of marines completed the local defences.

Soon after 9 a.m. on 3 June, the crew of a flying-boat from Midway saw 700 miles due west of the island about a dozen ships which they took to be part of the enemy's main fleet. Land-based bombers attacked some of the ships later in the day, but scored no hits.

9 Midway Island: Aichi D3A2 dive-bombers attack the *Yorktown*

Fletcher, with all three American carriers, was 300 miles east-north-east of Midway when, late that afternoon, he received news of these events. He judged in the light of the intelligence picture that the ships seen belonged to the invasion force and that Nagumo would approach from the north-west and launch an attack on the island at first light on 4 June. He therefore set a course which took him to a point about 200 miles due north of Midway by the time Nagumo reached his flying-off area some 200 miles west-south-west of him. The Japanese carriers were seen from a land-based reconnaissance aircraft at 5.30 a.m., and a few minutes later hostile aircraft were reported approaching the island. Thereupon Fletcher ordered Spruance to close with the enemy and attack him, adding that he would follow with the *Yorktown* as soon as her aircraft returned from a dawn reconnaissance.

Nagumo had in fact sent seventy-two bombers, escorted and supported by thirty-six fighters, to attack the island, keeping back ninety-three bombers armed with torpedoes and armour-piercing bombs to deal with any Allied warships that might be spotted from seaplanes despatched by his cruisers. Twenty-seven Buffalo and Wildcat fighters sent from Midway to intercept these aircraft, were outmatched by Nagumo's A6M2s and could not prevent the bombers from doing a great deal of damage to installations ashore.

Land-based bombers then took off to attack the Japanese carriers. They scored no hits and suffered crippling losses, but their arrival convinced Nagumo that he had failed to knock out the defences of Midway and must strike again. He therefore gave orders that the aircraft which were standing by to deal with any hostile warships that might appear should be rearmed for an attack on objectives ashore. Less than a quarter of an hour later he learned that the crew of a seaplane from one of his cruisers had seen ten ships approaching from a point due north of the island. After some delay he cancelled the orders he had given and directed that B5N2s still armed with torpedoes should retain them.

Yamamoto's Carrier Fleet crippled

Meanwhile Spruance was closing with the enemy at the best speed he could make. He calculated that the most favourable time to launch his aircraft would be 9 a.m., when he would be less than a hundred miles from Nagumo's fleet. His Chief of Staff, Captain Miles Browning, persuaded him that he would stand a better chance of catching the enemy at a disadvantage if he attacked earlier at the cost of giving his airmen a longer route to cover. Between 7 and 8 a.m., therefore, he flew off nearly all his dive-bombers and torpedo-bombers, keeping only a few dive-bombers and rather more than half his fighters to safeguard his fleet. Fletcher, following about two hours later, contributed roughly half the *Yorktown*'s aircraft.

The result was that Nagumo, who had learnt in the meantime that there was at least one carrier among the ships approaching him but did not know that there were three, was obliged to give battle at a time when, having abandoned the idea of a second attack on Midway Island, he was in the midst of rearming and refuelling the aircraft which had returned from the attack already made. The *Hornet's* dive-bombers went astray. None of the American torpedo-bombers scored any hits, and most of them were shot down. But they drew so much of the enemy's fire that dive-bombers from the *Enterprise*, followed by dive-bombers from the *Yorktown*, had a relatively easy passage. By midday the *Akagi*, the *Kaga*, and the *Soryu* were blazing wrecks, abandoned by their crews. Dive-bombers and torpedo-bombers from the *Hiryu* then put the *Yorktown* out of action, but later in the day the *Hiryu* was herself disabled by dive-bombers from the *Enterprise*, supplemented by a few aircraft transferred from the *Yorktown* before she had to be abandoned.

Next morning the *Hiryu*, in turn, had to be sunk by her own side. Admiral Yamamoto then ordered a general retirement. He still hoped that, after refuelling, he might be able to lure the *Enterprise* and the *Hornet* within range of his guns or of land-based bombers from Wake Island, but the Americans refused the bait. On 7 June he turned for home.

The loss of the *Akagi*, the *Kaga*, the *Soryu*, and the *Hiryu* was a blow from which the Japanese were never fully to recover. They still possessed an immensely powerful battlefleet. Apart from the light fleet carriers *Hosho*, *Ryujo*, and *Zuiho*, they still had the *Zuikaku*, the *Shokaku*, and the *Junyo*, soon to be joined by the *Junyo*'s sister-ship the *Hiyo*. Their B5N2 attack-bomber was still the best carrier-borne torpedo-bomber in the world. To reassert their supremacy at sea before the Americans recovered from the loss of the *Lexington* and the *Yorktown* might seem a task that ought not to have been beyond their power. The fact remains that, if a chance of once more tipping the scales in their favour while time was still on their side existed, they failed to take it. Throughout the remaining three years of war they never regained the lead lost in one day off Midway Island.

New Guinea and Guadalcanal

In May 1942 the Japanese authorities set up a new Seventeenth Army to take charge of troops in the South-West Pacific and prepare plans for the capture of New Caledonia, Fiji, and Samoa, with an expedition to Port Moresby as the first step. The failure of their first attempt to reach Port Moresby did not convince them that these projects were impractical, but they decided after the Battle of Midway Island to content themselves for the time being with preliminary moves. Port Moresby was to be taken by an overland advance from Buna, on the north coast of the Papuan peninsula. A new Eighth Fleet and 25th Air Flotilla, with headquarters at Rabaul, were formed to assume command of units already present and take up reinforcements as they arrived. The construction of airfields in the northern Solomons was to be speeded up, while in the British Solomon Islands Protectorate the seaplane base at Tulagi was to be supplemented by an airfield on the neighbouring island of Guadalcanal.

The first 2,000 of the 13,500 Japanese troops assigned to the capture of Port Moresby reached Buna on 21 July and began almost at once to advance along a jungle track which led by fairly easy stages to a point about fifty miles from the coast, and thence climbed over steep ridges and through deep valleys to a pass 7,000 feet above sea level. The main body did not arrive until the third week of August. In the meantime the Australians repelled an attack on their base at Milne Bay, at the south-eastern extremity of Papua, and the Americans gave a new slant to the war by themselves sending an expedition to Guadalcanal.

Greatly overestimating the strength of the Japanese garrison, the Americans disembarked a far larger force than they could hope to maintain without drawing on resources they were very reluctant to commit to the enterprise. To make matters worse, premature retirement of the carrier force which covered the landings led to the withdrawal of the transports before the unloading of supplies and equipment was completed. Once the airfield begun by the Japanese was ready for use, the Americans were able to exert a fair measure of control over the sea and air approaches to Guadalcanal throughout the daylight hours, but at night the adjacent waters were dominated by Japanese cruisers and destroyers from Rabaul. The reinforcement and provisioning of some 19,000 marines pinned to a shallow beach-head in one of the wettest and most fever-ridden islands in the world became an onerous task for the Americans at a time when they were trying to build up their naval strength and were committed to an Anglo-American Second Front in North Africa.

From the point of view of the Western Allies the Guadalcanal campaign did, however, have the unlooked-for advantage of occupying much of the attention of the Eighth Fleet and the 25th Air Flotilla, to the detriment of the Japanese troops in New Guinea. After a promising start, the Seventeenth Army's attempts to supply the Port Moresby Expeditionary Force along a single line of communication hemmed in by thick bush broke down in face of Allied air attacks. Malnutrition, dysentery, and a variety of gastric disorders killed off many of the troops. In the middle of September the survivors were halted about thirty miles short of their objective. During their subsequent advance to Buna the Australians, joined by an American contingent which moved partly by air, were able to use aircraft to bring forward not only rations and ammunition but also bridging equipment and supporting arms. By the end of the third week in January 1943, the whole of the Buna area was in Allied hands.

By that date the Japanese had made up their minds to withdraw from Guadalcanal. The last of their troops left the island on 7 February. In the meantime the running of reinforcements and supplies to Guadalcanal by both sides, and repeated attempts by the Japanese to knock out the American airfield by bombing and naval bombardment, led to a whole series of naval battles. These cost the Allies the *Wasp* and the *Hornet*, six heavy and two light cruisers, and fourteen destroyers. The Japanese lost the *Ryujo*, two battleships, one light and two heavy cruisers, eleven destroyers, and six submarines. Lessons tardily learnt by the Japanese were that unarmoured aircraft without self-sealing fuel tanks were an easy prey for contemporary Allied fighters, and that the army as well as the navy needed more and better long-range aircraft.

Japan on the Defensive

Early in 1943 the Japanese naval and military authorities came to the conclusion that recent events left them with no choice but to stand on the defensive. Expecting the Allies to thrust towards Rabaul by way of the Solomons in the east and New Guinea in the west, they decided that the Seventeenth Army should be responsible for troops in the northern Solomons and a newly-formed Eighteenth Army take charge of those at Lae, Salamaua, and Finchshafen. Both armies would be responsible to a new Eighth Area Army and receive air support from the 6th Air Division, also formed in recent months. The navy was to take care of the islands of the New Georgia group in the central Solomons, to which the Japanese had withdrawn their line when they removed their surviving troops from Guadalcanal.

Admiral Yamamoto came to the conclusion that the best way of defending the central Solomons was to make spoiling attacks on Allied bases. As he wished to keep the carrier force out of harm's way until he saw a chance of striking a decisive blow, he disembarked more than a hundred aircraft of the First Air Fleet and moved them to the South-West Pacific to reinforce the Eleventh Air Fleet.

How far the balance of power in the air had shifted since 1941 was shown when a series of raids by these and other aircraft in the first half of April yielded almost negligible results and cost the Japanese such heavy losses that the 1st Carrier Squadron had afterwards to be sent home to reorganize and refit. The Allies lost only one destroyer, one corvette, one tanker, and two merchant vessels sunk, and some twenty-five aircraft shot down.

The naval authorities, misled by exaggerated claims made by their airmen, did not know how few ships had been knocked out by the air attacks delivered on Yamamoto's orders in the first half of April. When the new Commander-in-Chief of the Combined Fleet, Admiral M. Koga, learned in October that the Allies had invaded Bougainville, he repeated Yamamoto's mistake by disembarking aircraft of the First Air Fleet and sending them to Rabaul to help the Eleventh Air Fleet. Nearly three-quarters of them were lost within a week of their arrival, and in any case their absence meant that the carrier force was virtually immobilized in home waters until they returned or were replaced. Moreover, their presence at Rabaul did not prevent

American carrier forces from twice venturing within range of land-based aircraft for the purpose of striking at heavy cruisers also sent there. None of the cruisers was sunk, although six were hit. But without them, and without a carrier force, Koga was unable to take any effective action against United States forces which seized Makin and Tarawa in the Gilbert Islands between 20 and 26 November. The only opposition in the air came from land-based aircraft of the 22nd Air Flotilla, now stationed in the Marshall Islands and with its strength much depleted by the transfer of units to the South-West Pacific. By the end of 1943 Rabaul, which had formerly been the biggest Japanese base in the whole Pacific, had been effectively neutralized and its garrison isolated.

Lae and Salamaua lost

An attempt by the Eighth Area Army to reinforce Lae in the previous month was even more spectacularly unsuccessful. Eight transports carrying 7,000 men and escorted by eight destroyers were sighted from Allied reconnaissance aircraft on 1 March, shadowed until after nightfall, and picked up again on the following day. In the Battle of the Bismarck Sea, bombers from bases in Papua sank all the transports and half the destroyers. Conversely, when Japanese torpedo-bombers attempted a night attack on an Allied convoy going in the opposite

10 (Above) Three versions of the Kawasaki Ki-60, an experimental forerunner of the highly successful Ki-61

direction, they were beaten off by anti-aircraft fire and not a ship was lost.

After this bad beginning – followed by the shooting down of G4M1s carrying Yamamoto and members of his staff as they were about to land at Bougainville – the failure of the Japanese to hold Lae, Salamaua, and the central Solomons does not seem surprising. Some good new aircraft, notably the Kawasaki Ki–61 armoured fighter, were introduced in 1943, but in numbers too small to turn the scale.

Towards the end of the year the naval and military authorities came to the conclusion that they were still trying to do too much. They decided, in principle, to shorten their front by pulling it back to a line running from Timor through western New Guinea to the Caroline Islands, and thence by way of the Mariana Islands to the Kuriles. The Marshall and Gilbert Islands, the northern Solomons, the Bismarck archipelago, and strategic points in New Guinea east of the new line would be defended as outpost positions to gain time for a massive build-up in the Philippines, the Carolines, and the Marianas. Fresh troops and air units were ordered forward from Japan and China, and once again new high-level formations were spliced into the chain of command. The planned production of aircraft during the next twelve months was raised from 35,000 to 50,000, although in practice output fell some 20 per cent short of the lower figure.

The Battle of the Philippine Sea

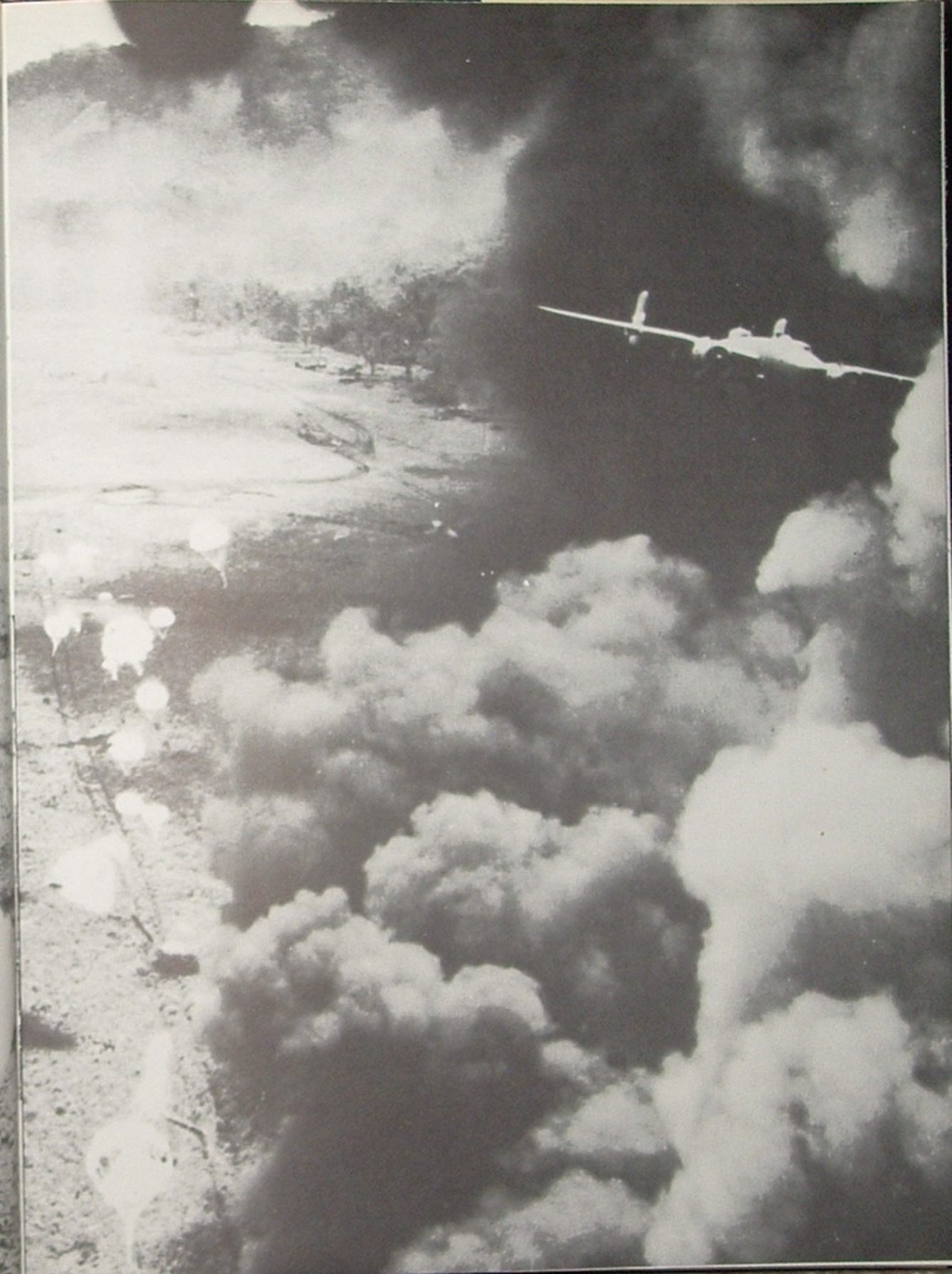
By the early part of 1944 there was general agreement in Japanese naval and military circles that Japan could hope to bring the war to a satisfactory conclusion only by winning a decisive battle and then seeking a negotiated peace. The naval authorities prepared for such a battle by concentrating the First Mobile Fleet in a central position, building up their strength in the air and moving as many land-based aircraft as possible to the Marianas, the Carolines, and the islands off north-western New Guinea.

In February the Allies put themselves a step closer to the Marianas and the Carolines by seizing the Marshall Islands. In April and May they established themselves in strength in Dutch New Guinea. Admiral S. Toyoda, who had succeeded Koga in command of the Combined Fleet when a flying-boat with Koga aboard it disappeared without trace between Palau and Davao, could not tell whether the Allies would make their first attempt to break through the Timor–New Guinea–Marianas line in the Central or the South-West Pacific. In either case he intended to do everything he could to lure their carriers within reach of his land-based aircraft before striking at them with the carrier-borne aircraft of the First Mobile Fleet. By early May about 550 land-based aircraft were deployed on a wide arc from the Marianas to Halmahera. The First Mobile Fleet had some 400 to 500 carrier-borne aircraft.

On 27 May Allied Forces in Dutch New Guinea invaded Biak Island off the north coast of New Guinea, 300 miles east of its western extremity. Toyoda, hitherto content that Biak should be defended only as an outpost position, saw that, if the expected naval battle took place in the triangle between New Guinea, the Carolines, and the Philippines, possession of the island's three airfields might enable the Allies to turn the tables on him by using land-based aircraft against his carriers. He sent more than a third of his land-based aircraft in the Marianas southwards to reinforce the 23rd Air Flotilla in Western New Guinea and Halmahera.

On 11 June carrier-borne aircraft of the United States Fifth Fleet, under Admiral Spruance, began a series of devastating attacks on objectives in the Marianas. These reduced the number of undamaged land-based aircraft left there to fewer than a hundred.

11 (Overleaf) Kawasaki Ki-61 fighters attacked on the ground by US bombers at an airstrip in New Guinea, February 1944



Toyoda at first suspected that the attacks were a diversion. By 13 June he was satisfied that invasion of the Marianas was imminent. He ordered Vice-Admiral J. Ozawa, who had succeeded Nagumo in command of the First Mobile Fleet, to make rendezvous east of the Philippines with a force from Halmahera. He also ordered the aircraft sent to Halmahera and New Guinea to come back, but many had already been lost and few completed the return flight.

Battle of the Philippine Sea

After keeping the rendezvous on 16 June and refuelling on the following day, Ozawa approached the Marianas on 18 June with five battleships, eleven heavy and two light cruisers, twenty-eight destroyers, and 473 aircraft embarked in four light fleet carriers and the fleet carriers *Taiho*, *Junyo*, *Hiyo*, *Shokaku*, and *Zuikaku*. American troops were already ashore in Saipan, but not in the other islands of the group. Admiral Spruance, having learnt on 15 June that Japanese warships were at sea, had ordered all transports to withdraw eastwards by nightfall on 17 June. At the same time he had ordered his Fast Carrier Force, with 956 aircraft in seven fleet carriers plus eight light fleet carriers, to assemble west of the island of Tinian on 18 June and make rendezvous with a small force under his direct command.

Ozawa knew that he was bound to be outnumbered and that his airmen were inferior in training and experience to those of 1941 and 1942. On the other hand, his aircraft had a bigger radius of action than the enemy's, and he believed he could count on substantial help from land-based aircraft. On learning during the afternoon of 18 June that his airmen had sighted American carriers to the east of him, he decided to make the most of these advantages by keeping out of the enemy's reach until the following morning and then striking with all his strength at a range of 300 miles.

That evening Ozawa disclosed his approximate position to the Americans by breaking wireless silence in order to communicate with the commander of the Fourteenth Air Fleet. Vice-Admiral M. A. Mitscher, commanding the Fast Carrier Force, thereupon proposed to put himself in a position to attack at daybreak by steaming westwards during the night, but Spruance forbade him to do so at the cost of leaving Saipan uncovered.

At 8.30 a.m. on 19 June Ozawa launched the first of four strikes by a total of well over 300

12 A Japanese aircraft approaches an American carrier during an Allied raid on Truk, 5 June 1944

aircraft. On each occasion Mitscher received good warning from his radar and was able to clear his decks of bombers and have plenty of fighters ready by the time the enemy arrived. Fighters that were not needed to intercept Ozawa's aircraft patrolled airfields still held by the enemy to prevent land-based aircraft from taking off, and bombers blasted their runways so that carrier-borne aircraft could not land on them. Apart from some fifty land-based aircraft destroyed, the day's attacks and searches cost Ozawa roughly half his entire complement of carrier-borne aircraft. Moreover, while the strikes were in progress, American submarines torpedoed the new fleet carrier *Taiho* and the veteran *Shokaku*. Some hours later both ships blew up and sank.

Ozawa, assuming that many aircraft which failed to return had landed at shore bases, was not aware of the full extent of his losses. In the afternoon he made off to the north, intending to refuel and then resume the battle with the aid of aircraft supposedly safe ashore.

Meanwhile Mitscher remained close to the Marianas because the wind was blowing from the east and he had repeatedly to turn into it to launch his aircraft. At 8 p.m., with all his aircraft recovered except twenty-nine lost in combat, he was at last free to set off in pursuit of the enemy. He ordered no air search during the night, and two searches made next morning failed to reveal Ozawa's whereabouts. It was not until the afternoon of 20 June that he learned that the enemy had been sighted 300 miles away to the north-west. Accepting the disadvantage of having to recover after nightfall aircraft whose pilots had little or no experience of deck landings in darkness, he despatched 131 torpedo-bombers and dive-bombers, escorted by eighty-five fighters. In a twenty-minute attack, begun just as the sun was setting, the *Hiyo* was sunk and the *Zuikaku*, the *Junyo*, two light fleet carriers, and a battleship and a heavy cruiser were damaged. About a hundred American aircraft failed to make safe landings, but a high proportion of the airmen concerned were rescued.

The Americans went on to complete the capture at Saipan, thus providing themselves with a secure base for B–29 bombers 1,200 miles from Tokyo. They also captured Guam and Tinian.

The Battle of Leyte Gulf

The Battle of the Philippine Sea did not leave the Japanese entirely without a carrier force. They still had the *Junyo*, the *Zuikaku*, nine light fleet carriers in various states of readiness, and two battleships – the *Hyuga* and the *Ise* – converted to carry E16A1 seaplanes intended for a dual role as reconnaissance aircraft and dive-bombers. The limiting factor was a shortage of pilots.

The naval authorities decided that, if Allied invasion forces approached the Philippines or Formosa before the deficiency could be made good, battleship and cruiser forces should attack them off the beaches while the carrier force – with or without aircraft – did its best to lead the American Fast Carrier Force away from the scene of action. Land-based naval and military aircraft were to engage the enemy's carrier-borne aircraft but switch as soon as possible to attacks on the invasion forces.

In August the Japanese naval and military authorities came independently to the conclusion that the next battle would be fought not in Formosa but in the Philippines. They agreed that the navy and the air forces of both services should attack the enemy whenever and wherever he tried to land, but that the troops in the Philippines should not be fully committed until Luzon was invaded.

However, in the course of air attacks which preceded landings in the Philippine island of Leyte, American carrier-borne aircraft struck at airfields in Formosa. The Japanese sent every available land-based aircraft to attack the enemy's warships, and Imperial General Headquarters published a communiqué in which they admitted the loss of 320 aircraft but claimed, on the strength of wildly inaccurate reports, that two American battleships and eleven carriers had been sunk. The mistake was soon discovered by the naval section of Imperial General Headquarters, but the army section was not informed. The result was that the military authorities, believing that the time had come for a decisive stroke, reversed their earlier decision and committed the troops in the Philippines to an all-out struggle for Leyte. This blunder made it doubly necessary for the Japanese that the naval battle should go well for them.

The essence of Admiral Toyoda's plan for the naval battle was that Ozawa's mobile fleet, consisting of the *Zuikaku* and three light fleet carriers with 106 aircraft between them, two converted battleships with no aircraft, and attendant light cruisers and destroyers should draw off the American Fast Carrier Force while a striking force of five battleships, ten heavy cruisers, two light cruisers, and fifteen destroyers made havoc of the enemy's invasion plan by sinking his transports in Leyte Gulf. The striking force, commanded by Vice-Admiral T. Kurita and starting from Singapore, was to gain access to the waters east of Leyte by passing through the San Bernardino Strait, between Luzon and the island of Samar, immediately north-east of Leyte. Two smaller forces under Vice-Admirals S. Nishimura and K. Shima were to enter Leyte Gulf from the south by way of the Surigao Strait, between Leyte and Mindanao.

13 Two Mitsubishi G4M bombers and a Mitsubishi A6M fighter about to succumb to phosphorous bombs at an airfield near Rabaul

Halsey's Mistake

By 17 October Toyoda knew that an Allied invasion fleet was approaching Leyte Gulf. Kurita left Singapore on the following day, but had to interrupt his voyage to refuel at Brunei Bay, in Borneo, and detach Nishimura's force from the force under his direct command. Two American submarines sighted him early on 23 October, sank two of his heavy cruisers, and damaged a third cruiser so badly that she had to be sent back to Singapore for repairs. Aircraft from American carriers east of the Philippines attacked him repeatedly on the following day. Their crews claimed to have sunk many of his ships and damaged others. In fact only one ship, the battleship *Musashi*, was sunk. Four ships were damaged, only one of them seriously. After retiring to the west for a time to escape further attacks, Kurita resumed his course towards the San Bernardino Strait and passed through it that night with the greater part of his force intact. While Kurita was approaching the San Bernardino Strait, about 200 land-based aircraft from Luzon attacked the American carriers, and sixty-seven were destroyed. On the same day Ozawa, hitherto undetected and eager to advertise his presence, sent seventy-six of his carrier-borne aircraft on a similar mission. Some were shot down, and the rest landed in Luzon. Ozawa was thus left with only thirty aircraft.

Meanwhile Admiral C. F. Halsey, commanding the United States Third Fleet – which was, for all practical purposes, the Fifth Fleet under a different designation – received from the

reports of his airmen the impression that Kurita's fleet no longer presented a serious threat to the invasion force. He announced his intention of forming a task force of battleships and cruisers to engage Kurita if he appeared east of the San Bernardino Strait, but did not form one. On learning during the afternoon of the whereabouts of Ozawa's carriers he fell into Toyoda's trap by taking his whole fleet northwards to engage them on the following day.

The San Bernardino Strait was thus left entirely unguarded. The only ships left to protect the transports in Leyte Gulf and engage Kurita, Nishimura, and Shima were the old battleships, cruisers, escort-carriers, and miscellaneous light craft of the bombardment and covering forces. These formed the Seventh Fleet under Vice-Admiral T. C. Kinkaid.

Kinkaid did not know that the San Bernardino Strait had been left unguarded. On the contrary, he believed that the task force mentioned by Halsey in a signal he had read was watching it. During the night of 24/25 October his battleships, cruisers, destroyers, and patrol boats sank or crippled nearly the whole of Nishimura's force, with the result that Shima, who could have achieved nothing in the situation in which he found himself, withdrew in time to save most of his ships. But between Kurita's battlefleet and the transports there were only some widely separated groups of escort-carriers and destroyers.

Luckily for the Allies, Kurita did not follow up his advantage. Apparently mistaking the escort-carriers for larger ships, and worried by his lack of air support and scanty knowledge of the whereabouts and composition of the enemy's forces, he retired after some hours of useless manoeuvring without ever getting close enough to the transports to use his guns against them. The American escort-carrier groups were afterwards attacked by suicide bombers, used for the first time a few days earlier and based on Luzon. They lost two escort-carriers and three destroyers, but had the satisfaction of sinking three of Kurita's cruisers and averting a potent threat to the invasion force.

To complete the discomfiture of the Japanese, in the course of the day the Fast Carrier Force sank all four of Ozawa's carriers, one of his three light cruisers, and two of his light destroyers. His two converted battleships were damaged but not disabled. The Japanese Navy would never again be able to put to sea with a balanced force.

Eclipse

In the latter part of 1943 the Japanese learned to their dismay that the Allies were preparing to attack their homeland with B–29 bombers which would be based near Calcutta and refuel at Chengtu in China. Counter-measures open to them were:

1 To strengthen their air defences, especially by providing themselves with adequate numbers of high-altitude interceptor fighters.
2 To seize Chengtu by mounting an offensive in China.

Both remedies were tried, but neither could receive their undivided attention. The development and manufacture of high-altitude fighters for home defence had to compete with the provision of more – and, if possible, newer and better – aircraft for units on active fronts. Launching an offensive in China was difficult at a time when the forces there were being depleted for the benefit of the Carolines, the Marianas, and the Philippines.

As things turned out, the offensive from South-East Asia did not begin until June 1944. Within a month or two the air defences of the Japanese homeland reached a strength of some 750 fighters and 600 anti-aircraft guns, but the ground organization was inadequate and their performance was poor. Allied losses were almost negligible.

Nevertheless the Allies were far from satisfied with the results. Access to Chengtu enabled B–29s to attack parts of the Japanese homeland, but some of the most valuable objectives were still beyond their reach. All fuel, bombs, and spares needed at Chengtu had to be carried by air at a time when the Allies were struggling to increase their air-lift to Chiang Kai-shek's army and had no carrying capacity to spare. There was always the risk that Chengtu might be captured and in any case the use of airfields in India and China did not make for secrecy. The Allies hoped at one time that the Russians would allow them to use airfields near Vladivostok, but it was not until Saipan was in their hands that they had a secure base from which all parts of the Japanese homeland could be reached.

Even then the results of their air attacks did not come up to expectations. Accurate bombing of industrial targets from heights of the order of 30,000 feet proved extremely difficult. At the end of 1944 the American authorities

noted that, after five weeks of bombing from the Marianas by the United States Twenty-First Bomber Command, only one of nine aircraft or aero-engine factories regarded as particularly important appeared to have been put out of action. To the Japanese the effects of the attacks made since November seemed far from negligible, but in January the Americans made a trial raid with incendiaries which left part of Kobe a burnt-out wreck. About 400 tons of incendiaries dropped on Tokyo in daylight later in the month devastated roughly a square mile of the city. Post-war research showed that the first raid had destroyed about 1,000 buildings, the second about 28,000.

In the light of these attacks, the United States Chief of Staff ruled that, while attacks were still to be made on aero-engine factories, priority should be given to large-scale incendiary raids on urban areas. An attack on Tokyo, delivered by some 300 aircraft on the night of 9/10 March, destroyed more than a quarter of a million buildings and made a million people homeless.

Even though fourteen bombers failed to return and more than forty were damaged, the Japanese were forced to admit that effective counter-measures to such raids as this were beyond their powers. Long before the first nuclear bomb fell at Hiroshima in August 1945, the Japanese Naval and Army Air Forces faced utter and irremediable defeat.

14 Unsuccessful attack by a Kamikaze pilot flying a Mitsubishi A6M on the USS *Missouri*

4 The Designation of Japanese Naval and Military Aircraft

Throughout the Second World War, and for many years before it, the Japanese naval and military authorities employed different methods of designating the makes and types of aircraft used by their air forces. Moreover, each of them employed two parallel systems. The Western Allies added a further complication by applying names of their own to the makes and types they believed the Japanese to be using or to be about to use.

Japanese Naval Aircraft: Short Designations

The Japanese naval authorities adopted in the late 1920s the practice of bestowing on a projected aircraft, when the design reached the stage at which detailed drawings were submitted, a 'short designation' which became, as it were, the surname of every aircraft built to that design or to one closely related to it.

A short designation consisted of:

1 A letter, or combination of letters, which indicated the function of the aircraft, in accordance with the following code:

- A = Carrier-borne fighter
- B = Carrier-borne 'attack-bomber' (i.e., torpedo-bomber or dual-purpose bomber and torpedo-bomber)
- C = Reconnaissance aircraft with wheeled undercarriage
- D = Carrier-borne bomber or dive-bomber
- E = Reconnaissance seaplane
- F = Observation seaplane
- G = Land-based attack-bomber
- H = Flying-boat
- J = Land-based fighter
- K = Trainer
- L = Transport or communications aircraft
- M = Special seaplane
- MX = Special purpose aircraft, powered or unpowered
- N = Fighter seaplane
- P = Bomber (i.e., general purpose bomber)
- Q = Patrol aircraft
- R = Land-based reconnaissance aircraft
- S = Night-fighter

2 A number which served, in the context of (1), to identify the specification, or statement of operational requirements, which the design was intended to meet.

3 A letter, or combination of letters, identifying the firm or organization responsible for the design, or to which development of the project had been entrusted. Nearly twenty such letters or combinations were used to denote firms or organizations with which the naval authorities dealt at one time or another, but only the following are significant in the context of the war of 1941–5:

- A = Aichi
- K = Kawanishi
- M = Mitsubishi
- N = Nakajima
- W = Watanabe (later Kyushu)
- Y = Dai-Ichi Kaigun Koku Gijitsusho (First Naval Air Technical Arsenal) at Yokosuka

Where two or more versions of an aircraft were built to substantially the same design, they were distinguished by a number which was appended to the short designation and formed part of it. Minor changes (e.g., in armament or equipment) were indicated by a suffix.

For example, the short designation of the aircraft known to the Western Allies as Alf was E7K2. The E showed that the aircraft was a reconnaissance seaplane, the 7 that it was the seventh aircraft of its kind put in hand since the introduction of the system. The K showed that the design was sponsored by Kawanishi, the 2 that it had been substantially modified since the original version was built. Had the second version differed from the first only in its armament or in some other minor respect, it would have been designated the E7K1a.

Japanese Naval Aircraft: Official Designations

When a Japanese naval aircraft went into series production, or even into limited production for experimental purposes, it retained its short designation but received also an official designation. Until the summer of 1943 this consisted of a type number based on the year in which production was first authorized, a brief description of its function, and in appropriate cases a model number, sometimes retrospectively bestowed. The official designation of the E7K2, for example, was Naval Type 94 Reconnaissance Seaplane Model 2 (later amended to Model 12). 'Type 94' meant that production of its forerunner, the E7K1, had been authorized in the Japanese year 2594 (i.e., in 1934). The meaning of 'Model 2' was obvious. However, soon after the E7K2 went into production the naval authorities adopted a new system by which every model number consisted of two digits, starting with Model 11. A subsequent version with substantially the same airframe as the first but a different engine became Model 12; a version with the same engine but a substantially modified airframe became Model 21. Where both airframe and engine were changed, the new version became Model 22. Since the E7K2 used an airframe almost identical with that of the E7K1 but was powered by a different engine, it was re-designated the Model 12 when the new system came into force.

Popular Designations

A comment often made on the navy's official designations was that they were colourless, uninspiring, and needlessly informative. Journalists complained of the difficulty of making a good story out of a communiqué dealing with the exploits of such dull-sounding aircraft as Naval Type 99 Carrier-Bombers and Naval Type 2 Floatplane Fighters. Staff officers disliked making the enemy a present of the knowledge that a particular aircraft had gone into production in a particular year. After nearly two years of war, the authorities deferred to these objections by substituting names of a more or less picturesque or emotive character for type numbers. Thus the Aichi E16A1, which would have been called Naval Type 3 Reconnaissance Seaplane under the old system, received the official designation Naval Reconnaissance Seaplane Auspicious Cloud. In general, names associated with meteorological phenomena of a fairly dramatic kind were used for day-fighters, names such as Moonlight and White Light for night-fighters. Bombers were named after celestial bodies or constellations or were given names associated with mountains. Variations on the word 'cloud' were applied to reconnaissance aircraft; names of trees and plants to trainers. The Kyushu Q1W1 anti-submarine patrol aircraft was called Eastern Sea, and an abortive version of the Kyushu K11W trainer intended for a similar role was to have been called South Sea.

Japanese Military Aircraft: Kitai and Guraida Numbers

In 1932 the Japanese military authorities adopted the practice of assigning a Kitai (airframe) number to every powered aircraft, built or projected, which owed its origin to a specification or statement of operational requirements issued by their air department. Even aircraft built before 1932 received Kitai (Ki) numbers if they were still in service or under development.

Gliders at first received Kitai numbers but were afterwards allotted Guraida (Ku) numbers.

Aircraft which did not owe their origin to a specification or statement of operational requirements issued by the military authorities received designations not related to the Kitai series. Apart from a few transport aircraft of foreign origin built under licence and used by or on behalf of the army after the outbreak of hostilities, the only aircraft in this category which calls for mention in the context of the war of 1941–5 was the Kayaba Ka–1. This was an autogyro designed and built by KK Kayaba Seisakusho after scrutiny of the wreckage of an imported autogyro which had crashed.

Kitai numbers were allotted in numerical sequence until 1944, when anomalies were introduced in the interests of security. They gave no indication of the function of the aircraft concerned or the identity of the firm or organization responsible for the design.

An aircraft retained its Kitai number when it went into production. Roman numerals appended to it were used to distinguish between different versions. Minor modifications, such as changes in armament or equipment, were indicated by a suffix. A Kaizo symbol (transliterated as KAI) denoted a major modification of an existing version.

How the system worked is well shown by the example of an aircraft designed by Kawasaki to meet the demand that existed in 1940 for an all-purpose fighter powered by a licence-built version of the Daimler-Benz DB 601A engine. The project was allotted the Kitai number Ki–61. After a dozen prototype or pre-production aircraft had been built and tested, the design was accepted as the basis of a production order for the Ki–61–I. This was built in two versions: the Ki–61–Ia with two 12·7-millimetre machine-guns and either two 7·7-millimetre machine-guns or two 20-milli-

15 (Left) Failure of the undercarriage caused this mishap to a personnel-carrying Mitsubishi Ki-21 heavy bomber
16 (Below) The jungle war: a Mitsubishi Ki-21 heavy bomber in flight
17 and 18 (Right) Captured A6M3 fighters bearing (above) American and (below) British markings

metre cannon, and the Ki–61–Ib with either four 12·7-millimetre machine-guns or the same armament as the more powerfully armed variant of the Ki–61–Ia. A modified Ki–61–I with strengthened wings and brackets for drop-tanks or bombs was then introduced as the Ki–61–I KAI. This, too, was built in two versions: the KAIc with two machine-guns and two 20-millimetre cannon, and the KAId with two machine-guns and two 30-millimetre cannon. Meanwhile the Ki–61–II, a redesigned model with a more powerful engine and slightly longer wings than the Ki–61–I, was tested and found unsatisfactory. It was replaced by the Ki–61–II KAI, which retained the new engine but had the same wings as the Ki–61–I KAI. Once more, two versions were built. A third model, the Ki–61–III, was projected but did not go into production.

Japanese Military Aircraft: Official Designations

The Japanese military authorities used official designations consisting, like those used by the navy until 1943, of a type number followed by a brief description of function and, in appropriate cases, a model number. Type numbers were the same as those used by the navy, except that the naval authorities treated the Japanese year 2600 as Year 0 while the military authorities treated it as Year 100. Model numbers followed a straightforward numerical and alphabetical sequence. The Ki–48–Ia, for example, was Model 1A, the Ki–48–Ib Model 1B, and so on. Popular names were adopted at a fairly early stage, but they were not used systematically and they did not supersede type numbers.

Allied Code Names

During the first few months of the war of 1941–5 the Western Allies had great difficulty in identifying and classifying Japanese aircraft. Their knowledge of the equipment of the Japanese naval and army air forces was incomplete, and such information about types and designations as reached active theatres of war was found hard to assimilate. One might think that, once the existence of different naval and military systems was understood, such designations as A6M2 and Ki–32 should have been no more baffling than Me 109 and Ju 88. But the naval short designations and the Kitai numbers never became part of the vocabulary of Allied units in the field. Aircraft were known at first by abbreviated versions of the official designations, or by vernacular names which sometimes differed from theatre to theatre.

In the summer of 1942 an Australian, Air Commodore J. E. Hewitt, Director of Intelligence at the headquarters of the Allied Air Forces in the South-West Pacific Area, gave Captain Frank T. McCoy Jr, an American officer from Tennessee, the daunting task of classifying Japanese aircraft and codifying the names by which they were known to the Allies. Some names, such as Abdul for the Nakajima Ki–27 and Jim for the Nakajima Ki–43, had already become familiar, but Captain McCoy decided to make a fresh start. With the help of Sergeant Francis Williams, the senior of his two assistants, he allotted seventy-five names in the first month. He afterwards explained the rather outlandish character of some of them by pointing out that he wanted names which were not only short and simple, but also unusual and therefore likely to be remembered. He began by choosing hillbilly names such as Zeke and Rufe, with which he was familiar and whose unfamiliarity to others was no disadvantage.

In principle, names were allotted on the following basis:

1 Fighters and reconnaissance seaplanes were given boys' Christian names or first names.
2 Bombers, dive-bombers, torpedo-bombers, flying-boats, and reconnaissance aircraft other than seaplanes received girls' Christian names or first names.
3 Transport aircraft were given girls' names beginning with T.
4 The names of trees were used for trainers.
5 Gliders were named after birds.

In practice, these rules were not always rigidly applied. The Nakajima Ki–44 Demon was called Tojo, from the surname of the Japanese Prime Minister and Minister of War, when it was first seen in China, and the name was allowed to stand. The Nakajima G5N2–L transport aircraft was called Liz because, when it was first heard of, the Allies rightly believed that the Japanese hoped to develop it as a long-range bomber.

The section set up by Captain McCoy continued to allot names used throughout the South-West Pacific and South Pacific Areas and South-East Asia until the summer of 1944, when responsibility for code names was assumed by a joint-service organization in the United States.

On the whole, the authorities succeeded in choosing names which were easily remembered and reasonably appropriate, but there were exceptions. The abbreviated first name Val, allotted to the Aichi D3A dive-bomber, is to say the least not self-evidently feminine, and it might be thought that nine people out of ten would mistake the rather unusual Frances – applied to the Yokosuka P1Y naval bomber – for the more familiar boys' name Francis. However, as the Japanese also developed a night-fighter version of the P1Y, perhaps the ambiguity was intentional.

The Allies allotted the following code names to real or supposed aircraft which, for the reasons given, were not used by the Japanese:

ADAM	Supposed Nakajima SKT–97 seaplane. Did not exist.
BELLE	Kawanishi H3K1 flying-boat. Obsolete by 1941.
BEN	Supposed Nagoya-Sento KI–001 fighter. Did not exist.
BESS	Heinkel He 111. Wrongly believed to be built under licence for the navy.
BOB	1: Supposed Aichi Type 97 seaplane. Did not exist. 2: Kawasaki Ki–28. Not accepted for production.
DICK	Seversky A8V1 naval fighter. Imported aircraft obsolete by 1941.
DOC	Messerschmitt Me (Bf) 110. Wrongly believed to be in service with Japanese Naval Air Force.
DORIS	Supposed Mitsubishi B–97 bomber. Did not exist.
EVA or EVE	Civil aircraft wrongly believed to be a bomber.
FRANK	Code name for Nakajima Ki–48, at one time erroneously applied to non-existent Mitsubishi TK–4 fighter.
FRED	Version of Focke-Wulf Fw–190, wrongly believed to be in service with Japanese Army Air Force.
GUS	Supposed Nakajima AT–27 fighter. Did not exist.
HANK	Aichi E10A reconnaissance seaplane. Obsolete by 1941.
HARRY	Non-existent Mitsubishi TK–4 fighter, also called Frank.
IONE	Supposed Aichi AI–104 seaplane. Did not exist.
IRENE	Junkers Ju 87A. Wrongly believed to be in service with Japanese Army Air Force.
JANICE	Junkers Ju 88A–5. Wrongly believed to be in service with Japanese Army Air Force.
JERRY	Heinkel He 112B–0. Imported aircraft obsolete by 1941.
JOE	Supposed TK–19 fighter. Did not exist.
JOYCE	Supposed bomber version of Tachikawa trainer and communications aircraft. Did not exist.
JULIA	Supposed Type 97 heavy bomber, afterwards found to be Ki–48 light bomber.
JUNE	Supposed seaplane version of Aichi D3A, afterwards found to be Aichi E13A1 reconnaissance seaplane.
LOISE or LOUISE	Mitsubishi Ki–2 light bomber. Obsolete by 1941.
MIKE	Messerschmitt Me (Bf) 109E. Wrongly believed to be in service with Japanese Army Air Force.
MILLIE	Vultee V–11GB. Wrongly believed to be built by Showa Hikoki KK for navy.
NORMA	Supposed Type 97 light bomber afterwards found to be Mitsubishi Ki–15 reconnaissance aircraft.
OMAR	Supposed Suzukaze 20 fighter. Did not exist.
RAY	Supposed Mitsubishi Type 1 fighter afterwards found to be Mitsubishi A6M.
RUTH	Fiat BR 20. Imported aircraft no longer in service in 1941.
SLIM	Watanabe E9W reconnaissance seaplane. Obsolete by 1941.
TRIXIE	Junkers Ju 52/3m. Wrongly believed to be in service with Japanese Army Air Force.
TRUDY	Focke-Wulf Fw 200. Wrongly believed to be used by navy.

Duplicate names for aircraft which the Japanese did use, where they are known to the author, are given in the reference section.

19 A wrecked Kawasaki Ki-45 heavy fighter on Wake Island in western New Guinea

REFERENCE SECTION

Aircraft are described in this section under the name of the firm or organization responsible for the design, or where the design originated with an independent source, under the name of the firm or organization entrusted with development of the project. The following abbreviations have been used:

Aichi	Aichi Tokei Denki KK Aichi Kokuki KK
Kawanishi	Kawanishi Kokuki KK
Kawasaki	Kawasaki Kokuki Kogyo KK
Kayaba	KK Kayaba Seisakusho
Kokusai	Nippon Kokusai Koku Kogyo KK
Kyushu	KK Watanabe Tekkosho Kyushu Hikoki KK
Mitsubishi	Mitsubishi Jukogyo KK
Nakajima	Nakajima Hikoki KK
Rikugun	Rikugun Kokukijutsu Kenkyujo
Tachikawa	Tachikawa Hikoki KK
Yokosuka	Dai-Ichi Kaigun Koku Gijitsusho
Appendix	
Bücker	Bücker Flugzeugbau GmbH
Douglas	Douglas Aircraft Company
Lockheed	Lockheed Aircraft Corporation
Messerschmitt	Bayerische Flugzeugwerke Messerschmitt AG
North American	North American Aviation Incorporated

Where a firm or organization designed or developed aircraft both for the Japanese Naval Air Force and for the Japanese Army Air Force, naval aircraft come first.

The naval aircraft designed or developed by a given firm or organization are described in the alphabetical order of the first letter of the short designation, irrespective of the date of introduction. For example, the Aichi B7A2 precedes the Aichi D1A2, although the B7A2 did not go into production until 1944 and the D1A2 was obsolescent by 1941.

Where a firm was responsible for more than one naval aircraft whose short designation begins with the same letter, the order in which these aircraft are described is determined by the number that follows the initial letter. Thus the Aichi E13A1 precedes the Aichi E16A1, the Mitsubishi G3M the Mitsubishi G4M.

The army aircraft designed or developed by a given firm or organization are described in the order of their Kitai (Ki) numbers or, in the case of gliders, their Ku numbers. For easy reference a separate list of such numbers, keyed to the names of firms and organizations, is given on the opposite page.

The technical data are based on what is believed to be the best information available. Where speeds, ranges, and service ceilings are concerned it should, however, be borne in mind that the figures in manufacturers' archives and official reports are derived, as a rule, from the results of tests made in conditions which may differ a good deal from those of everyday life, or sometimes merely from calculations which may rest upon dubious assumptions. Estimates of range, in particular, tend to be somewhat academic. The performance of an aircraft in service conditions depends not only on its inherent qualities but also on such factors as climate, weather, the skill and conscientiousness of ground and air crews, and the amount of flying it has done since its last major overhaul. The Nakajima Ki-27 Army Type 97 fighter was officially credited with a maximum speed of 292 miles an hour, but whether it ever achieved much more than 250 miles an hour in South-East Asia is doubtful.

In accordance with modern practice, linear measurements are given in metric form. Equivalents in feet and inches, correct to the nearest inch, have been added to facilitate comparison with contemporary British and American aircraft. Wing areas are given to the nearest square foot or tenth part of a square metre. Altitudes are approximate, and have been rounded off where unrounded figures might give a false impression of the standard of accuracy adopted. The figures in feet are, therefore, not necessarily exact equivalents of the metric figures.

Speeds of naval aircraft are given in knots, those of army aircraft in kilometres and miles an hour. Ranges are in nautical miles and statute miles respectively. Laden and unladen weights of aircraft are given both in kilograms and in pounds. Bomb loads, on the other hand, are given only in metric form. The avoirdupois equivalent of 500 kilogrammes is 1,102 pounds, but it does not necessarily follow that a Japanese aircraft designed to carry a 500-kilogram bomb could carry a 1,000-pound bomb, because size and shape as well as weight have to be taken into account. Similarly, no attempt has been made to translate calibres measured in millimetres into unfamiliar inch equivalents.

20 (Previous pages) The Ki-61. Not of Italian origin, as the Allies thought, but developed by Kawasaki to exploit a German-designed engine

Kitai Numbers

The Kitai numbers of the army aircraft described in the following pages are listed below. Official designations are given, in abbreviated form, in the second column. The third column shows the name of the firm or organization under which the aircraft is described. Numbers omitted are those applied to abortive projects or to aircraft of no significance in the context of the war of 1941–5.

Ki-9	Type 95-1 Trainer	Tachikawa
Ki-10	Type 95 Fighter	Kawasaki
Ki-15	Type 97 Cmd Recce Aircraft	Mitsubishi
Ki-17	Type 95-3 Trainer	Tachikawa
Ki-21	Type 97 Heavy Bomber	Mitsubishi
Ki-27	Type 97 Fighter	Nakajima
Ki-30	Type 97 Light Bomber	Mitsubishi
Ki-32	Type 98 Light Bomber	Kawasaki
Ki-34	Type 97 Transport Aircraft	Nakajima
Ki-36	Type 98 Army Co-Op Aircraft	Tachikawa
Ki-43	Type 1 Fighter	Nakajima
Ki-44	Type 2 Single-Seater Fighter	Nakajima
Ki-45	Type 2 Two-Seater Fighter	Kawasaki
Ki-46	Type 100 Cmd Recce Aircraft	Mitsubishi
Ki-48	Type 99 TE Light Bomber	Kawasaki
Ki-49	Type 100 Heavy Bomber	Nakajima
Ki-51	Type 99 Assault Aircraft	Mitsubishi
Ki-54	Type 1 Advanced Trainer	Tachikawa
Ki-55	Type 99 Advanced Trainer	Tachikawa
Ki-56	Type 1 Freight Transport	Kawasaki
Ki-57	Type 100 Transport Aircraft	Mitsubishi
Ki-59	Type 1 Transport Aircraft	Kokusai
Ki-61	Type 3 Fighter	Kawasaki
Ki-67	Type 4 Heavy Bomber	Mitsubishi
Ki-70	Experimental Cmd Recce Aircraft	Tachikawa
Ki-71	Ki-71 Experimental Tac/R Aircraft	Mitsubishi
Ki-74	Experimental High-Altitude LRB Ki-74	Tachikawa
Ki-76	Type 3 Cmd Liaison Aircraft	Kokusai
Ki-77	Experimental LR Research Aircraft	Tachikawa
Ki-84	Type 4 Fighter	Nakajima
Ki-86	See Appendix: Bücker Bü-131	
Ki-93	Experimental Fighter and Gd Attack Aircraft	Rikugun
Ki-100	Type 5 Fighter	Kawasaki
Ki-102	Type 4 Assault Aircraft Experimental High-Altitude Fighter Experimental Night-Fighter	Kawasaki
Ki-105	Experimental Transport Aircraft	Kokusai
Ki-109	Ki-109 Interceptor	Mitsubishi

Guraida Numbers

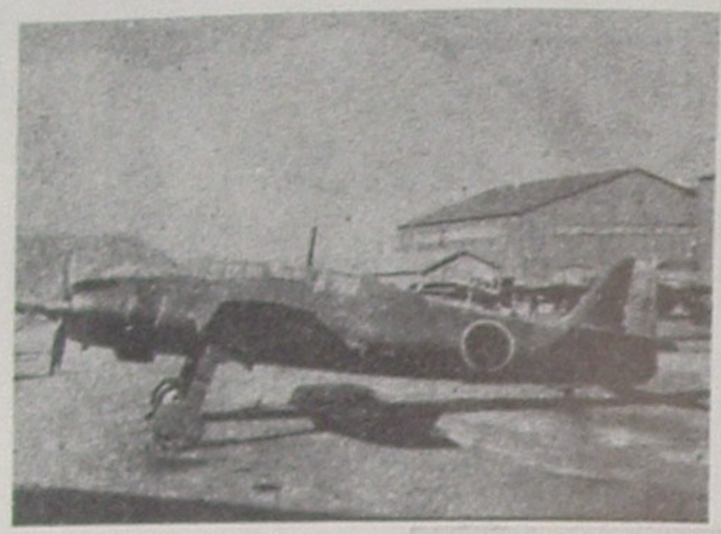
Ku-7	Experimental Transport Glider Crane	Kokusai
Ku-8	Type 4 Large Transport Glider	Kokusai

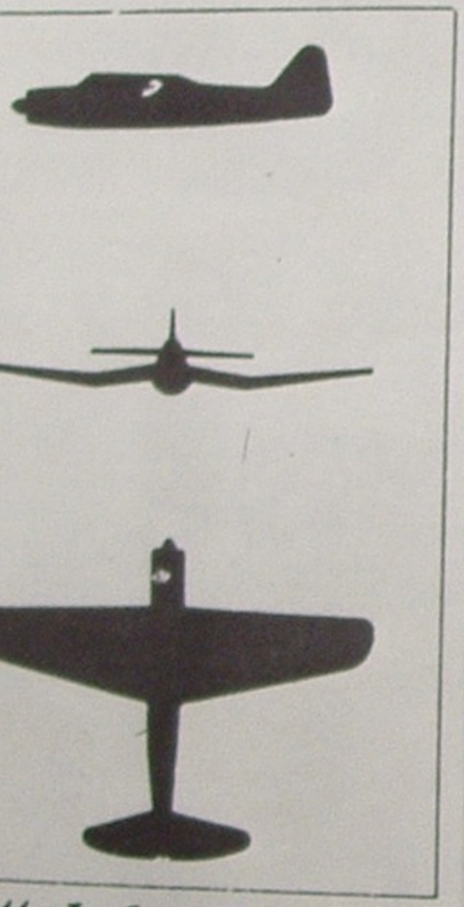
Special Designations

Ka-1	Model 1 Observation Autogyro	Kayaba
LO	See Appendix: Lockheed 14-WG3	

21 Missile and carrier: *Ohka*-carrying Mitsubishi G4M2e heavy bomber with *Ohka* attached and crew in foreground

流星一一型





(GRACE) RYUSEI MODEL 11

Principal Perfcrmance

Speed (Knot)

Maximum (Attacking) 290(6000)
(335 mph @ 19,600')

(Bombing) 300(6000)
(345 mph @ 19,600')

Cruising 200 (4000)
(230 mph @ 13,100')

Service Ceiling (meter)

Cruising Range (Nautical Miles)
(Attacking) 1500 (1715 stat.)
(Bombing) 1800 (2075 stat.)

Armament (M. Gun) (mm) (Fixed) 7.7 x 2
(Revolving) 7.7 x 1

Bomb (Kgs.) 800 x 1 (1760 lb.) x 1
500 x 1 (1100 lb.) x 1
250 x 2 (550 lb.) x 2
60 x 6 (132 lb.) x 6

Torpedo - 1

Measurement (Meters)

Span 14.40 (47.25')
Overall Length 11.45 (37.6')

GRACE 11 IO JIMA 9 MAR. 45. RESTR. JICPOA NEG. 50311-3.

22 Aichi B7A2 Naval Carrier-borne Attack Bomber *Ryusei* (Shooting Star). Called by the Allies GRACE, the *Ryusei* was in production from the spring of 1944 to the summer of 1945. The performance figures are Allied wartime estimates

Aichi Aircraft

Aichi B7A2 Shooting Star

Official des.	Naval Carrier-borne Attack-Bomber Shooting Star
Allied code name	Grace
Manufacturers	Aichi Kokuki KK Dai-Nijuichi Kaigan Kokusho
Description	Inverted gull-wing mid-wing monoplane intended to operate from large carriers in dual role as bomber and torpedo-bomber
Engine	2,000-h.p. Nakajima Homare 12 air-cooled radial
Span	14·4 m (47 ft 3 in)
Length	11·49 m (37 ft 8 in)
Height	4·075 m (13 ft 4 in)
Wing area	35·4 sq m (381 sq ft)
Weight empty	3,810 kg (8,400 lb)
Weight loaded	5,625 kg (12,401 lb)
Crew	Two
Maximum speed	306 knots at 6,550 m (21,500 ft)
Cruising speed	Not known
Range	Normal: 1,000 nautical miles Maximum: 1,640 nautical miles
Service ceiling	11,250 m (37,000 ft)
Bomb-load	Normally, two 250-kg bombs or one 800-kg torpedo; but up to 800 kg of bombs could be carried.
Armament	Two wing-mounted, forward-firing 20-mm Type 99 Model 2 cannon; one flexibly mounted, rearward-firing 7·92-mm. Type 1 or 13-mm. Type 2 machine-gun

The Aichi *Ryusei*, or Shooting Star, was designed by Norio Ozaki, Morishige Mori and Yasushiro Ozawa to meet a specification which called for a high-performance carrier-borne torpedo-bomber, or 'attack-bomber', with the manoeuvrability of a fighter. A mid-wing configuration was adopted to provide clearance for a ventral bomb-bay and a large air-screw. The wings had therefore to be of inverted gull-wing shape, since otherwise the legs of the retractable undercarriage would have been too long.

The almost untried Nakajima eighteen-cylinder Homare engine, on which the naval authorities insisted, proved troublesome, but eventually its imperfections were overcome. No less than nine prototype or pre-production versions of the *Ryusei*, all bearing the designation B7A1, were built and tested before, in the early summer of 1944, the B7A2 went into production. Unlike its forerunners, which used the 1,800-horse-power Homare 11, it was powered by the 2,000-horse-power Homare 12. Some 80 B7A2s were built by Aichi, another 25 at the 21st Naval Air Arsenal (Dai-Nijuichi Kaigun Kokusho) at Omura. Too large to be accommodated in fleet carriers of the *Akagi* or the *Shokaku* class, they were intended for a new generation of carriers capable of handling aircraft whose length exceeded the limit of 11 metres previously imposed. In the outcome, those ready for service by the end of the war were allotted to land-based units. A version powered by the Homare 23 engine, to be called the B7A3, was projected, but apart from installing one of these engines in a B7A2 Aichi made no progress with the venture.

Aichi D1A2

Official des.	Naval Type 96 Carrier-Bomber
Allied code name	Susie
Manufacturer	Aichi Tokei Denki KK
Description	Two-seater biplane dive-bomber with fixed spatted undercarriage
Engine	730-h.p. Nakajima Hikari 1 air-cooled radial
Span	11·4 m (37 ft 5 in)
Length	9·3 m (30 ft 6 in)
Height	3·41 m (11 ft 2 in)
Wing area	34·7 sq m (374 sq ft)

A carrier-borne dive-bomber with a maximum speed of 167 knots, the D1A2 was an improved version of the slower but very similar D1A1, which in turn was derived from the Heinkel He 66. D1A2s took part in the attack on shipping in the Yangtze River on 12 December 1937, which led to the sinking of the U.S. gunboat *Panay* and damage to the British gunboat *Ladybird*. They were in production from 1936 to 1940. Some sixty or seventy were still on the strength of naval establishments when Japan went to war with the Western Powers in 1941, but they were no longer employed by first-line units.

23 & 24 Three-quarter and side views of Aichi D3A2 Naval Type 99 Carrier-borne Bomber Model 22. In its day a highly effective carrier-borne dive-bomber, it received the Allied code name VAL

Aichi D3A1 and D3A2

Official des.	D3A1: Naval Type 99 Carrier-Bomber Model 11 D3A2: Naval Type 99 Carrier-Bomber Model 22
Allied code name	Val
Manufacturers	Aichi Tokei Denki KK Aichi Kokuki KK (from 1943) Showa Hikoki Kogyo KK (D3A2 only)
Description	Low-wing monoplane dive-bomber with fixed spatted undercarriage, designed as carrier-borne bomber but used also as land-based bomber and on rare occasions as fighter
Engine	D3A1: 1,000-h.p. Mitsubishi Kinsei 43 or 1,070-h.p. Mitsubishi Kinsei 44 air-cooled radial D3A2: 1,300-h.p. Mitsubishi Kinsei 54 air-cooled radial
Span	14·365 m (47 ft 2 in)
Length	10·195 m (33 ft 5 in)
Height	3·847 m (12 ft 7 in)
Wing area	34·9 sq m (376 sq ft)
Weight empty	D3A1: 2,408 kg (5,309 lb) D3A2: 2,570 kg (5,666 lb)
Weight loaded	D3A1: 3,650 (8,047 lb) D3A2: 3,800 kg (8,378 lb)
Crew	Two
Maximum speed	D3A1: 209 knots at 3,000 m (10,000 ft) D3A2: 232 knots at 6,000 m (20,000 ft)
Cruising speed	160 knots at 3,000 m (10,000 ft)
Range	D3A1: 800 nautical miles D3A2: 730 nautical miles
Service ceiling	D3A1: 9,300 m (30,000 ft) D3A2: 10,500 m (34,500 ft)
Bomb-load	One 250-kg bomb under fuselage, two 60-kg bombs in wing-racks
Armament	Two forward-firing 7·7-mm. Type 97 machine-guns in engine-cowling, one flexibly mounted 7·7-mm. Type 92 machine-gun firing to the rear

To meet the demand for a monoplane successor to the D1A2, Aichi produced in 1937 a prototype D3A powered by a 710-h.p. Nakajima engine and fitted with dive-brakes based on those of the Ju 87. This was not successful; but an improved version with an 840-h.p. Mitsubishi engine, stronger dive-brakes, a larger wing area and the designation D3A1 showed up well when tested against a rival prototype submitted by Nakajima. Subsequent modifications included a still more powerful engine and a large dorsal fin to improve directional stability. About 470 aircraft of the production series were manufactured between the last few weeks of 1939 and the summer of 1942. D3A1s serving with Admiral Nagumo's Striking Force were extremely successful at Pearl Harbor, and they also acquitted themselves well when Nagumo took his carriers into the Indian Ocean in the spring of 1942. Thereafter, as a result of losses suffered by the carrier force in the battles of the Coral Sea and Midway Island, bombers intended for service at sea were relegated in increasing numbers to land-based units.

The D3A2, similar in appearance to the D3A1 but with a spinner in front of the airscrew and a slightly different canopy over the rear cockpit, made its first flight in June 1942 and was in production by the end of August. Aichi completed about 800 D3A2s in the course of the next two years; Showa

Hikoki Kogyo, of Tokyo, about 200 between the last few weeks of 1942 and the end of the war. Large numbers were shot down during the Allied advance to the Philippines in 1944. Both D3A1s and D3A2s were used as trainers in the later stages of the war, and after the battle of the Philippine Sea a fairly high proportion of these were sacrificed in suicide attacks.

Aichi E13A1, A1a and A1b

Official des.	E13A1: Naval Type O Reconnaissance Seaplane Model 1 E13A1a: Naval Type O Reconnaissance Seaplane Model 11A E13A1b: Naval Type O Reconnaissance Seaplane Model 11B
Allied code name	Jake
Manufacturers	Aichi Tokei Denki KK KK Watanabe Tekkosho Kyushu Hikoki KK (from 1943) Dai-Juichi Kaigun Kokusho
Description	Floatplane of low-wing monoplane configuration designed for reconnaissance, armed reconnaissance, strikes and escort missions from cruisers, seaplane tenders and permanent or improvised seaplane anchorages
Engine	1,060-h.p. Mitsubishi Kinsei air-cooled radial
Span	14·5 m (47 ft 7 in)
Length	11·3 m (37 ft 1 in)
Height	7·4 m (24 ft 3 in)
Wing area	36 sq m (388 sq ft)
Weight empty	2,642 kg (5,825 lb)
Weight loaded	3,640 kg (8,025 lb)
Crew	Three
Maximum speed	203 knots at 2,200 m (7,200 ft)
Cruising speed	120 knots at 2,000 m (6,500 ft)
Range	1,200 nautical miles
Service ceiling	8,700 m (28,000 ft)
Bomb-load	One 250-kg bomb, or four 60-kg bombs or depth charges
Armament	One flexibly mounted, rearward firing 7·7-mm. Type 92 machine-gun, supplemented in some late models by one flexibly mounted, downward firing 20-mm. Type 99 cannon

In the summer of 1937 the Japanese naval authorities invited Aichi, Kawanishi and Nakajima to submit proposals for a two-seater floatplane to succeed the Kawanishi E7K1 biplane of 1933. Later they issued a specification calling, in addition, for a three-seater. Aichi, unlike Kawanishi and Nakajima, built prototypes to meet both specifications; but eventually both they and the naval authorities came to the conclusion that a three-seater was what the navy needed. By the time their prototype E13A1 was ready an improved version of the E7K, the E7K2, was in production. However, towards the end of 1940 the authorities, after testing the E13A1 in competition with two prototypes submitted by Kawanishi, accepted it as the basis of a production model. The outcome was a highly successful aircraft which overlapped the E7K2 and, with only minor modifications, remained in service throughout the war. Aichi built about 130 E13A1s before they were ordered, in 1942, to devote their productive effort to dive-bombers. KK Watanabe Tekkosho, reorganized in 1943 as Kyushu Hikoki KK, then took over the manufacture of the aircraft, producing about 1,200 by the end of the war. In addition, some fifty were

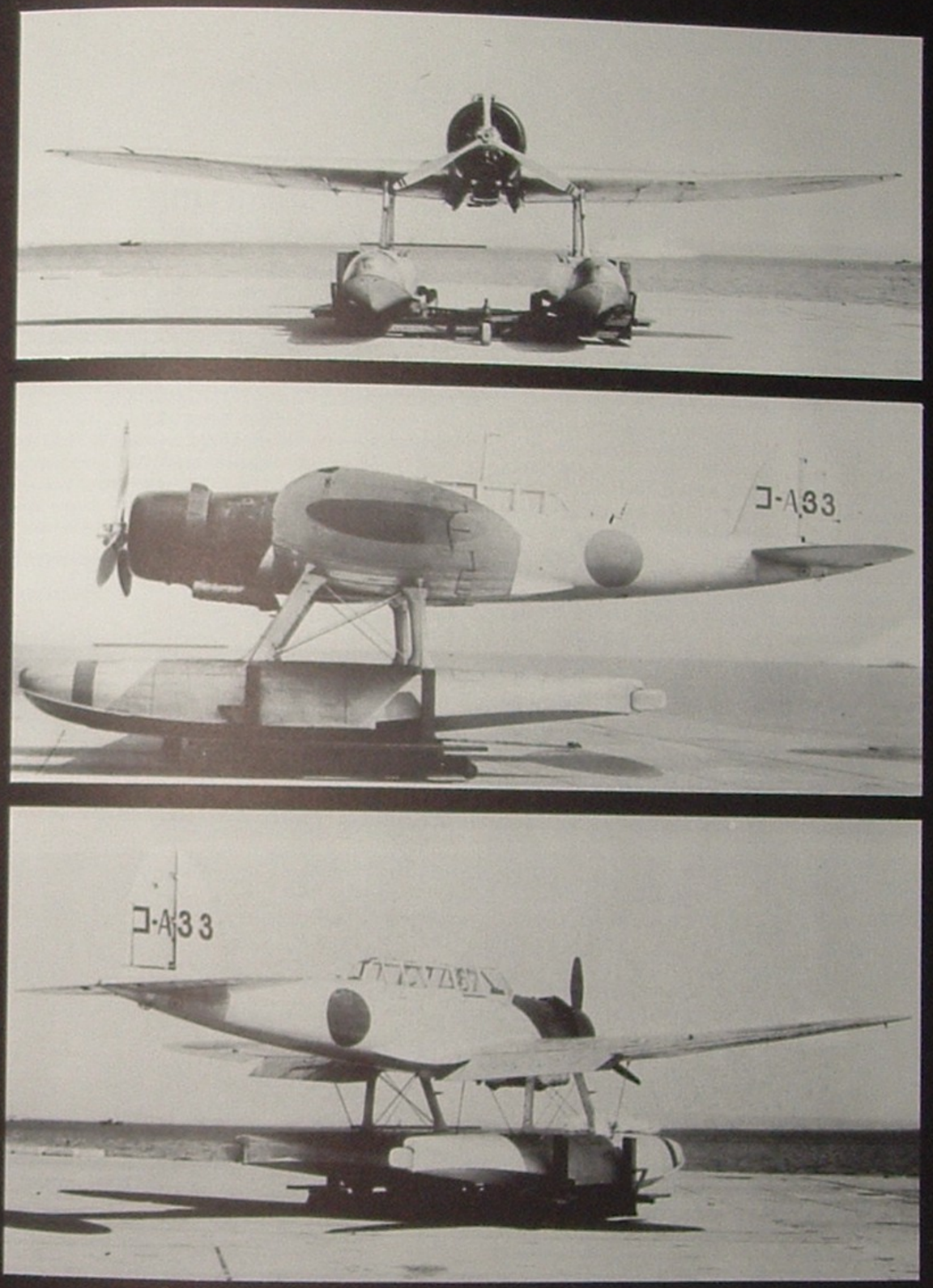
25 Aichi E16A1 Naval Reconnaissance Seaplane *Zuiun* (Auspicious Cloud). Known to the Allies as PAUL, it was used chiefly for armed reconnaissance and shipping strikes

manufactured at the 11th Naval Air Arsenal (Dai-Juichi Kaigun Kokusho) at Hiro. The E13A1a differed from the original version only in being fitted with additional bracing struts, a spinner in front of the airscrew and improved radio equipment; the E13A1b, besides incorporating these changes, was equipped with air-to-surface radar. All three versions, besides performing the functions for which they were designed, were used for a variety of tasks, including air-sea rescue, the bombing of objectives on land and sea, suicide missions and the conveyance of commanders and staff officers to conferences.

Aichi E16A1 Auspicious Cloud

Official des.	Naval Reconnaissance Seaplane Auspicious Cloud Model 11
Allied code name	Paul
Manufacturers	Aichi Kokuki KK Nippon Hikoki KK
Description	Floatplane dive-bomber of low-wing monoplane configuration designed for armed reconnaissance from cruisers and seaplane tenders
Engine	1,300-h.p. Mitsubishi Kinsei 51 or Kinsei 54 air-cooled radial
Span	12·81 m (42 ft)
Length	10·833 m (35 ft 7 in)
Height	4·791 m (15 ft 9 in)
Wing area	28 sq m (301 sq ft)
Weight empty	2,945 kg (6,493 lb)
Weight loaded	3,900 kg (8,598 lb)
Crew	Two
Maximum speed	237 knots at 5,500 m (18,000 ft)
Cruising speed	180 knots at 5,000 m (16,000 ft)
Range	Normal: 635 nautical miles Maximum: 1,300 nautical miles
Service ceiling	10,000 m (33,000 ft)
Bomb-load	One 250-kg bomb under fuselage
Armament	Two wing-mounted, forward-firing 20-mm. Type 99 Model 2 cannon; one flexibly mounted, rearward-firing 13-mm. Type 2 machine-gun

The genesis of the E16A1 was an attempt made by the Japanese naval authorities in 1939 to envisage the kind of seaplane that would eventually be needed to replace the E13A1, then still in the prototype stage and not destined to go into production until late in the following year. After a long delay, Kishiro Matsuo and Yasushiro Ozawa, of Aichi, drew up a tentative design and the authorities built a specification round it. The first of three prototypes was completed in 1942, and in August 1943 the third was accepted as the basis of a production model. Unlike the E13A1, the E16A1 was conceived from the outset as a dive-bomber. Nearly 200 E16A1s were built between January 1944 and the summer of 1945 by Aichi; some sixty by Nippon Hikoki KK at Yokohama. Large numbers were shot down in 1944, and many of the survivors were relegated to suicide attacks. An improved version, the E16A2, was planned, but the prototype was still under development when the war ended. It was powered by a 1,560-h.p. Mitsubishi Kinsei 62 air-cooled radial engine.



26 Three views of Aichi E13A Naval Type O Reconnaissance Seaplane. The Allies called it JAKE

27 Kawanishi E15K1 Naval Type 2 High-Speed Reconnaissance Seaplane *Shiun* (Violet Cloud). The Allied code name was NORM

Aichi H9A1

Official des.	Naval Type 2 Training Flying-Boat Model 11
Allied code name	None
Manufacturers	Aichi Kokuki KK Nippon Hikoki KK
Description	Flying-boat of parasol-wing monoplane configuration designed as trainer but used occasionally for off-shore patrols
Engines	Two 710-h.p. Nakajima Kotobuki 42 or 43 air-cooled radials
Span	24 m (78 ft 9 in)
Length	16·95 m (55 ft 7 in)
Height	5·25 m (17 ft 3 in)
Wing area	63·3 sq m (681 sq ft)

Designed and built for the express purpose of providing an advanced trainer for naval airmen converting to the Kawanishi H8K1, the Aichi H9A1 had a maximum speed of 171 knots and could accommodate three pupils in addition to a five-man crew. Three prototypes and twenty-four aircraft of the production series were completed by Aichi between 1940 and 1943, four production aircraft by Nippon Hikoki in 1944. The H9A1 was used to a limited extent in an operational role for off-shore reconnaissance in home waters, but it was not seen by Allied airmen and its existence is said to have been unknown to the Allies until the end of the war.

Kawanishi Aircraft

Kawanishi E7K2

Official des.	Naval Type 94 Reconnaissance Seaplane Model 2 (later called Model 12)
Allied code name	Alf
Manufacturers	Kawanishi Kokuki KK Nippon Hikoki KK
Description	Three-seater floatplane of biplane configuration designed for reconnaissance and armed reconnaissance from cruisers and seaplane tenders and for convoy escort and anti-submarine patrols
Engine	870-h.p. Mitsubishi Zuisei 11 air-cooled radial
Span	14 m (45 ft 11 in)
Length	10·5 m (34 ft 5 in)
Height	4·85 (15 ft 10 in)
Wing area	43·6 sq m (469 sq ft)
Weight empty	2,100 kg (4,630 lb)
Weight loaded	3,300 kg (7,275 lb)
Crew	Three
Maximum speed	149 knots at 2,000 m (6,500 ft)
Cruising speed	100 knots at 1,000 m (3,300 ft)
Range	1,200 nautical miles
Service ceiling	7,000 m (23,000 ft)
Bomb-load	Two 60-kg or four 30-kg bombs
Armament	One forward-firing, one rearward-firing and one downward-firing 7·7-mm. Type 92 machine-gun

The E7K2, developed from the E7K1 designed by Kawanishi in 1932 and 1933, made its first flight in prototype form in 1938. About 300 of these aircraft were built by Kawanishi and Nippon Hikoki KK between November of that year and 1941. Although slow, they were handy, reliable and much liked by their crews. The E7K2 was used during the first two years of the war for maritime reconnaissance, submarine-spotting and convoy escort, and later for a variety of other tasks, including training.

Kawanishi E15K1 Violet Cloud

Official des.	Naval High-Speed Reconnaissance Seaplane Violet Cloud Model 11
Allied code name	Norm
Manufacturer	Kawanishi Kokuki KK
Description	Unsuccessful high-performance reconnaissance seaplane with jettisonable central float and single engine driving a pair of contra-rotating airscrews
Engine	1,500-h.p. Mitsubishi Kasei 14 or 1,850-h.p. Mitsubishi Kasei 24 air-cooled radial driving two contra-rotating airscrews
Span	14 m (45 ft 11 in)
Length	11·587 m (38 ft)
Height	4·95 m (16 ft 3 in)
Wing area	30 sq m (323 sq ft)
Weight empty	3,165 kg (6,978 lb)
Weight loaded	4,100 kg (9,039 lb)
Crew	Two
Maximum speed	253 knots at 5,700 m (18,700 ft)
Cruising speed	160 knots at 2,500 m (8,200 ft)
Range	1,820 nautical miles
Service ceiling	9,830 m (32,250 ft)
Bomb-load	Two 60-kg bombs
Armament	One flexibly mounted, rearward-firing 7·7-mm. Type 92 machine-gun

The Kawanishi *Shiun*, or Violet Cloud, was Kawanishi's response to a specification of 1939 which called for a reconnaissance seaplane capable of outperforming contemporary British and American land-based fighters. By using an exceptionally powerful engine to drive two contra-rotating airscrews, the firm managed to produce an aircraft which was extremely fast for a two-seater floatplane, but even so was considerably slower in normal trim than such land-based rivals as the Hawker Hurricane and the Supermarine Spitfire. In an emergency the crew could, however, gain an additional 50 knots by jettisoning the large central float. Two stabilizing floats near the wingtips, normally extended before touchdown, had then to be kept retracted to enable the aircraft to alight safely. Although this arrangement gave rise to endless trouble, production was begun in 1943, after six prototypes or experimental aircraft had been built. Nine aircraft of the production series were completed, and six were sent to the cruiser *Oyodo* to be tried out on active service. They were soon shot down by Allied fighters because on each occasion the jettisoning system failed to work. Production was discontinued early in 1944.

Kawanishi H6K2, H6K4 and H6K5

Official des.	H6K2: Naval Type 97 Flying-Boat Model 11 H6K4: Naval Type 97 Flying-Boat Model 22 H6K5: Naval Type 97 Flying-Boat Model 23
Allied code name	Mavis
Manufacturer	Kawanishi Kokuki KK
Description	Large flying-boat of parasol-wing monoplane configuration intended primarily for long-range maritime reconnaissance but adaptable for other tasks
Engines	H6K2: Four 1,000-h.p. Mitsubishi Kinsei 43 air-cooled radials H6K4: Four 1,000-h.p. Mitsubishi Kinsei 43 or four 1,070-h.p. Mitsubishi Kinsei 46 air-cooled radials H6K5: Four 1,300-h.p. Mitsubishi Kinsei 51 or 53 air-cooled radials
Span	40 m (131 ft 3 in)
Length	25·625 m (84 ft 1 in)
Height	6·27 m (20 ft 7 in)
Wing area	170 sq m (1,830 sq ft)
Weight empty	H6K2: 10,340 kg (22,796 lb) H6K4: 11,707 kg (25,810 lb) H6K5: 12,380 kg (27,117 lb)

Weight loaded	H6K2: 16,000 kg (35,274 lb) H6K4: 17,000 kg (37,479 lb) H6K5: 17,500 kg (38,581 lb)
Crew	Nine
Maximum speed	H6K2: 179 knots at 2,100 m (6,900 ft) H6K4: 186 knots at 4,000 m (13,00 ft) H6K5: 208 knots at 6,000 m (20,000 ft)
Cruising speed	H6K2: not known H6K4: 120 knots at 4,000 m (13,000 ft) H6K5: 140 knots at 4,000 m (13,000 ft)
Range	H6K2: 2,230 nautical miles H6K4: 2,590 nautical miles (normal); 3,283 nautical miles (maximum) H6K5: 2,667 nautical miles (normal); 3,656 nautical miles (maximum)
Service ceiling	H6K2: 7,600 m (25,000 ft) H6K4 and 5: 9,600 m (31,500 ft)
Bomb-load	Two 800-kg torpedoes, or up to 1,000 kilograms of bombs
Armament	H6K2: One 7·7-mm. Type 92 machine-gun in the bow, one in a power-operated dorsal turret, one in the tail H6K4 and 5: Two 7·7-mm. Type 92 machine-guns in forward and dorsal positions, two in 'blisters' to port and starboard, one 20-mm. Type 99 Model 1 cannon aft

The H6K was designed by Yoshio Hashiguchi, in association with Shizuo Kikahura and others, after a visit to Short Brothers by members of Kawanishi's staff. The prototype, powered by four 840-h.p. Nakajima engines, made its first flight in the summer of 1936. Production of the H6K2 began early in 1938, after four pre-production aircraft of the H6K1 series had been built. Three of these, including the prototype tested in 1936, were then fitted with 1,000-h.p. engines and commissioned as naval aircraft. Only ten H6K2s were completed, making a total of thirteen with the three updated K1s. These were followed by 127 H6K4s and 36 H6K5s built between 1939 and 1942. The total of 176 does not include aircraft of the H6K class intended from the outset to serve as passenger, service transport or communications aircraft. Long-range maritime reconnaissance was the primary function of H6Ks allotted to first-line units, but in the first few months of the war they were sometimes used as long-range bombers.

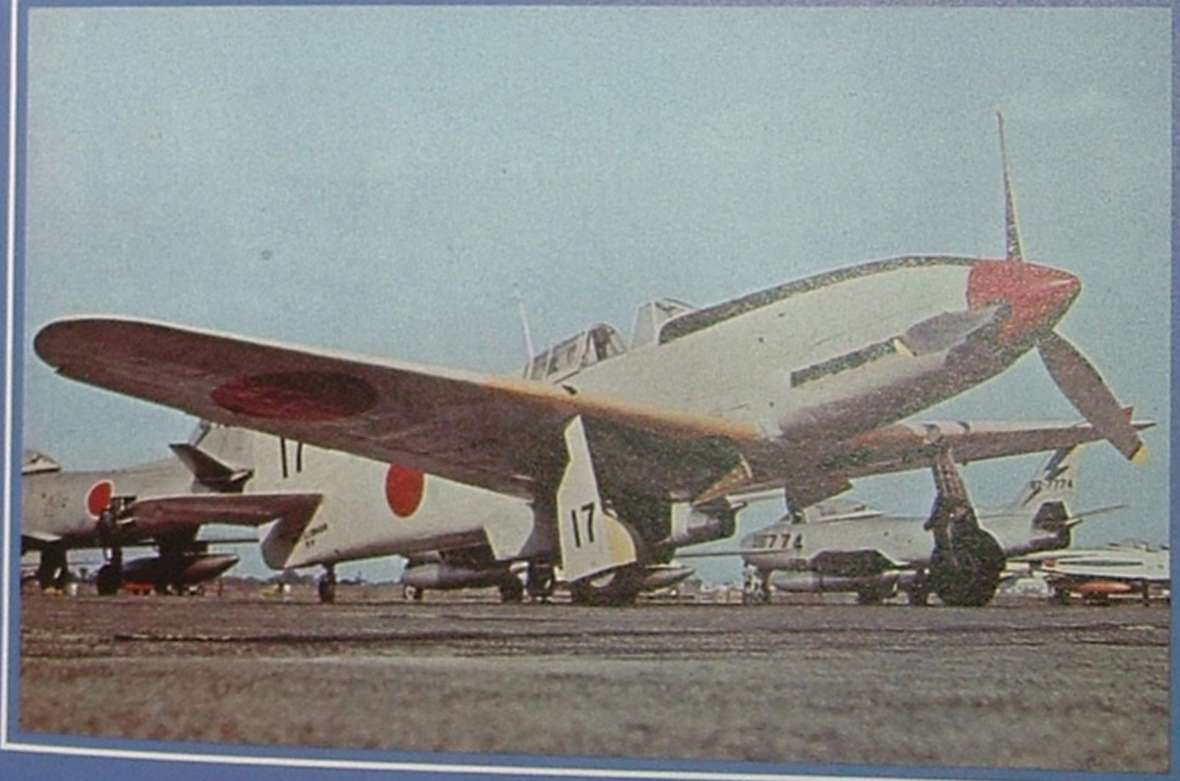
Kawanishi H6K2–L and H6K4–L

Official des.	2–L: Naval Type 97 Transport Flying-Boat H6K2–L 4–L: Naval Type 97 Transport Flying-Boat H6K4–L
Allied code name	Tillie
Manufacturer	Kawanishi Kokuki KK
Description	Transport and communications version of H6K flying-boat
Engines	2–L: 4 × 1,000-h.p. Kinsei 43 4–L: 4 × 1,070-h.p. Kinsei 46
Span	as H6K2
Length	as H6K2
Height	as H6K2
Wing area	as H6K2
Weight empty	12,025 kg (26,511 lb)
Weight loaded	17,100 kg (37,699 lb)
Crew	Eight
Maximum speed	180 knots at 2,600 m (8,500 ft)
Cruising speed	130 knots at 1,000 m (3,300 ft)
Normal range	2,337 nautical miles
Bomb-load	None. Accommodation for up to 18 passengers
Armament	None

In 1939 Kawanishi modified two H6K2s as experimental transport aircraft for naval or civilian use. Thereafter they built sixteen H6K2–Ls and twenty H6K4–Ls with accommodation for up to eighteen passengers as well as mail and cargo. In addition two reconnaissance aircraft of the H6K4 series were converted to the transport specification. Of these thirty-eight aircraft, twenty were used by the navy for staff transport and eighteen allotted to Dai Nippon Koku KK (Greater Japan Airlines) for use on the routes linking Yokohama with Saigon, Bangkok, Timor, and the Caroline Islands.

COLOUR SECTION

1 Kawasaki Ki-61 Army Type 3 Fighter *Hien* (Swallow). The Allies called it TONY



II Mitsubishi A6M Naval Type O Carrier-borne Fighter *Reisen* (Zero Fighter).
Known to the Allies as ZEKE

III Mitsubishi J2M3 Naval Interceptor Fighter *Raiden* (Thunderbolt).
The Allied code name was JACK

IV (and V, below) Kawanishi N1K2-J Naval Interceptor Fighter *Shiden* (Violet Lightning).
Code name GEORGE

V

VI Nakajima Ki-84 Army Type 4 Fighter *Hayate* (Gale). Code name FRANK

VII Three-quarter view of Nakajima Ki-84

VIII Nakajima Ki-84 photographed at an International Aerospace show in Japan

IX Nakajima Ki-43-II Army Type 1 Fighter *Hayabusa* (Peregrine Falcon). Known to the Allies as OSCAR, it made a powerful impression on them when it first appeared over South-East Asia

X Mitsubishi A6M Naval Type O Carrier-borne Fighter *Reisen* (Zero Fighter)

XI Wreckage of an A6M *Reisen* (Zero Fighter) forced down on Melville Island (due north of Darwin) during the attack on Darwin by carrier-borne aircraft on 19 February 1942

XII A restored A6M2 Zero Fighter now in the Tokyo Science Museum

XIII Simulated attack by Nakajima B5N2 torpedo-bombers and Aichi D3A1 dive-bombers, escorted and covered by Mitsubishi A6M2 (Zero) fighters, on battleships and airfields at and near Pearl Harbor. A still taken during the filming of the Japanese-American film *Tora! Tora! Tora!*

Four stills from
Tora! Tora! Tora!

XIV Simulated Aichi D3A1 dive-bomber (VAL) photographed at Pearl Harbor
XV Simulated briefing of pilots for Pearl Harbor raid, 7 December 1941

XVI Simulated attack on U.S. air base on Oahu, 7 December 1941

XVII Drawing of a Nakajima B5N2 torpedo-bomber (KATE) attacking U.S. warships in 'Battleship Row', Pearl Harbor.

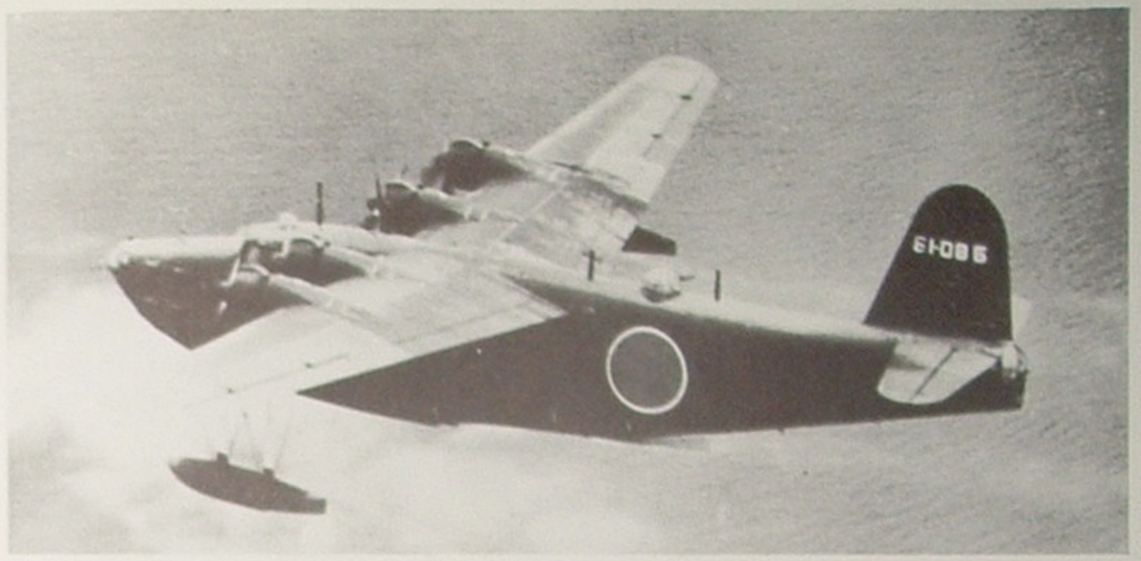
Five photographs taken by Michael Claringbould of wrecked Japanese planes in the jungle

XVIII Rear view of the remains of a Mitsubishi Ki-21 Heavy Bomber (SALLY) in New Guinea
XIX Wreckage of an Aichi D3A1 dive-bomber in New Ireland

XXII Overleaf: Mitsubishi G4M1 Heavy Bomber (BETTY), abandoned more than thirty years ago

XX Wrecked Mitsubishi A6M Zero Fighter in New Guinea
XXI Remains of a Nakajima Ki-49 Heavy Bomber (HELEN) damaged by bombing at Alexishaven

XXIII Japanese recruiting poster



Kawanishi H8K1 and H8K2

Official des.	H8K1: Naval Type 2 Flying-Boat Model 11 H8K2: Naval Type 2 Flying-Boat Model 12
Allied code name	Emily
Manufacturer	Kawanishi Kokuki KK
Description	Large high-wing monoplane flying-boat of advanced design for long-range maritime reconnaissance
Engines	H8K1: Four 1,530-h.p. Mitsubishi Kasei 11 or Kasei 12 air-cooled radials H8K2: Four 1,850-h.p. Mitsubishi Kasei 22 air-cooled radials with water injection
Span	38 m (124 ft 8 in)
Length	28·13 m (92 ft 4 in)
Height	9·15 m (30 ft)
Wing area	160 sq m (1,722 sq ft)
Weight empty	H8K1: 15,502 kg (34,176 lb) H8K2: 18,380 kg (40,521 lb)
Weight loaded	24,500 kg (54,013 lb)
Crew	Ten
Maximum speed	H8K1: 234 knots at 5,000 m (16,500 ft) H8K2: 252 knots at 5,000 m (16,500 ft)
Cruising speed	160 knots at 4,000 m (13,000 ft)
Maximum range	H8K1: 3,890 nautical miles H8K2: 3,860 nautical miles
Service ceiling	H8K1: 7,600 m (25,000 ft) H8K2: 8,800 m (29,000 ft)
Bomb-load	Two 800-kg torpedoes or eight 250-kg bombs; alternatively, sixteen 60-kg bombs or depth charges
Armament	H8K1: Two 20-mm. Type 99 Model 1 cannon and four or five 7·7-mm. Type 92 machine-guns in forward, dorsal, ventral, beam, and tail positions H8K2: Five 20-mm. Type 99 Model 1 cannon and five 7·7-mm. Type 92 machine-guns in forward, dorsal, ventral, beam, and tail positions

The Kawanishi H8K was designed to meet a specification of 1938 which called for a large flying-boat, superior in performance to the Short Sunderland, as a follow-up to the H6K. The prototype was completed at the end of 1940 and first flew in January 1941. Many modifications were made, and two pre-production models were built, before the naval authorities sanctioned series production. Kawanishi built fourteen H8K1s, in addition to the pre-production models, before switching in 1943 to the H8K2. This was substantially the same aircraft as the H8K1 so far as its airframe was concerned, but its four Kasei 22 engines enabled the manufacturers to achieve a higher maximum speed and provide a more powerful defensive armament without making any significant sacrifice of range. Well over a hundred H8K2s were completed between 1943 and 1945. Unlike most Japanese aircraft, the H8K was well armoured, and its fuel tanks were to some extent self-sealing. Powerfully armed and exceptionally fast for an aircraft of its type, the H8K2 had the reputation of being extremely hard to shoot down.

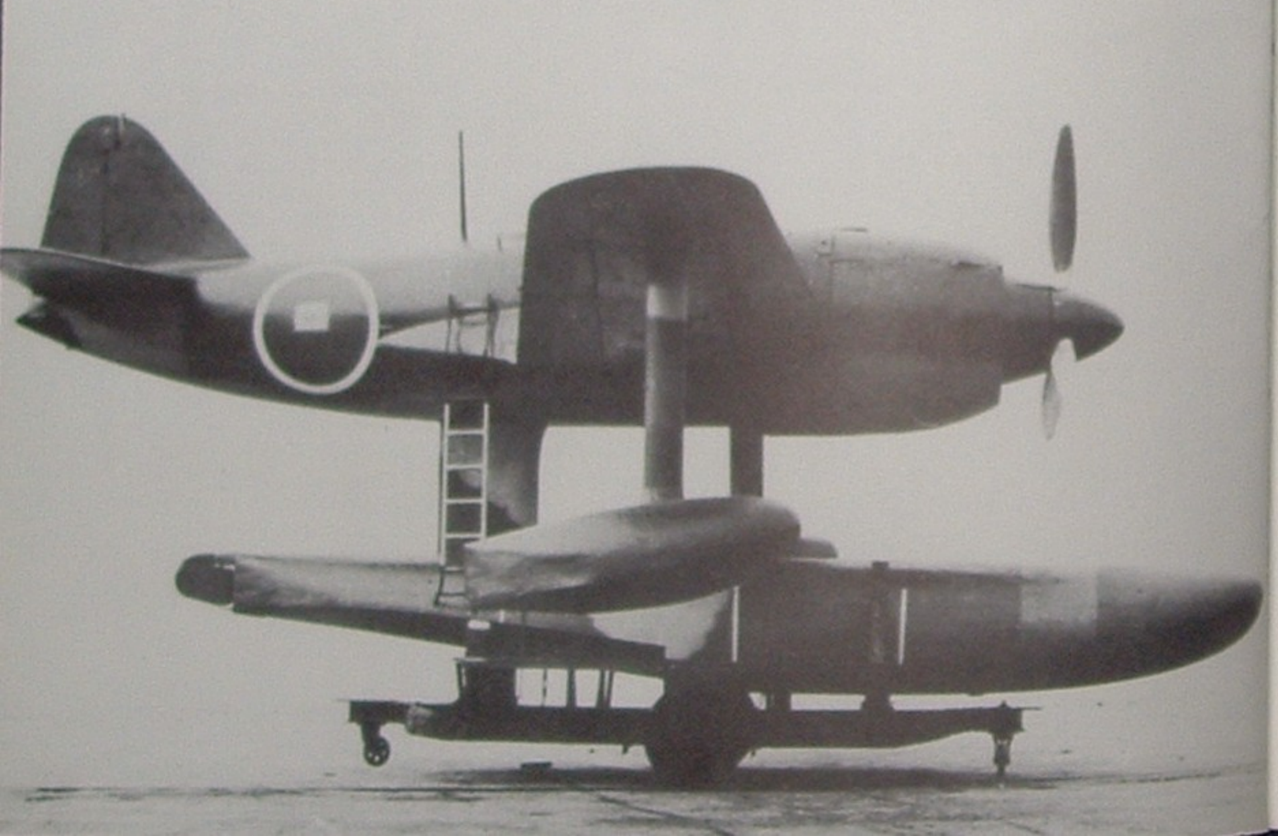
28 Kawanishi H8K Naval Type 2 Flying-Boat. In the opinion of some enthusiasts one of the most graceful aircraft ever built, this long-range maritime reconnaissance machine was known to the Allies as EMILY

29 Kawanishi N1K1 Naval Fighter Seaplane *Kyofu* (Mighty Wind). A 300-mile-an-hour seaplane called by the Allies REX

Kawanishi H8K2–L Clear Sky

Official des.	Naval Type 2 Transport Flying-Boat Clear Sky
Allied code name	(Emily)
Manufacturer	Kawanishi Kokuki KK
Description	Transport version of H8K in production from 1943 to 1945
Engines	Four 1,850-h.p. Mitsubishi Kasei 22 air-cooled radials with water injection
Span	38 m (124 ft 8 in)
Length	28·13 m (92 ft 4 in)
Height	9·15 m (30 ft)
Wing area	160 sq m (1,722 sq ft)
Weight empty	16,900 kg (37,258 lb)
Weight loaded	26,683 kg (58,826 lb)
Crew	Nine
Maximum speed	227 knots at 4,000 m (13,000 ft)
Cruising speed	160 knots at 4,000 m (13,000 ft)
Maximum range	2,400 nautical miles
Service ceiling	Not known
Bomb-load	None. Accommodation for up to sixty-four troops, or up to twenty-nine passengers travelling in reasonable comfort
Armament	One 13-mm. Type 2 machine-gun in the bow, one 20-mm. Type 99 Model 1 cannon in the tail

When the H8K1 went into production, the prototype was used as an experimental aircraft for the development of a transport version. Two decks were installed in the hull and most of the defensive armament and some of the fuel tanks were removed. The prototype, thus modified, was employed by the naval authorities as a communications aircraft, and thirty-six aircraft were built to the modified design. All were used by the navy as communications aircraft or troop transports, none delivered to Dai Nippon Koku KK, which continued until the end of the war to use the H6K. No code name distinct from that allotted to the first-line version was given by the Allies to this aircraft, and that is not surprising since outwardly the H8K1, H8K2 and H8K2–L were virtually indistinguishable.



Kawanishi N1K1 Mighty Wind

Official des.	Naval Fighter Seaplane Mighty Wind Model 11
Allied code name	Rex
Manufacturer	Kawanishi Kokuki KK
Description	Single-seater seaplane fighter of mid-wing monoplane configuration designed to support landings and provide cover over beach-heads
Engine	1,460-h.p. Mitsubishi Kasei 13 or 1,530-h.p. Mitsubishi Kasei 15 air-cooled radial
Span	12 m (39 ft 4 in)
Length	10·589 m (34 ft 9 in)
Height	4·75 m (15 ft 7 in)
Wing area	23·5 sq m (253 sq ft)
Weight empty	2,752 kg (6,067 lb)
Weight loaded	3,500 kg (7,716 lb)
Crew	One
Maximum speed	264 knots at 5,700 m (18,700 ft)
Cruising speed	200 knots at 2,000 m (6,500 ft)
Range	Normal: 570 nautical miles Maximum: 900 nautical miles
Service ceiling	10,560 m (34,500 ft)
Bomb-load	Two 30-kg bombs could be carried
Armament	Two wing-mounted 20-mm. Type 99 Model 1 cannon and two fuselage-mounted 7·7-mm. Type 97 machine-guns

The Japanese naval authorities foresaw in 1940 that, in the event of war with the Western Powers, they might be called upon to put troops ashore at places out of reach of land-based fighters and where the use of carrier forces would be uneconomic. The Kawanishi *Kyofu*, or Mighty Wind, was designed to meet a consequent demand for seaplane fighters capable of providing air support during and after disembarkation and of operating from improvised bases. The prototype made its maiden flight on 6 May 1942, but production did not get into its stride until the summer of the following year. By that time Japan had more need of defensive weapons than of aircraft expressly designed to support offensive operations. After a few months, therefore, production of the N1K1 was suspended in favour of the N1K1–J, a land-based counterpart cast for a defensive role. The result was that, although the *Kyofu* was a success so far as its performance was concerned, only some ninety aircraft of the production series were delivered.

Kawanishi N1K1–J and N1K2–J Violet Lightning

Official des.	N1K1–J: Naval Interceptor Fighter Violet Lightning Model 11, 11A, 11B, 11C N1K2–J: Naval Interceptor Fighter Violet Lightning Modified Model 21, 21A	
Allied code name	George	
Manufacturers	Kawanishi Kokuko KK Omura Kaigun Kokusho (ten aircraft only) Mitsubishi Jukogyo KK (nine aircraft only) Aichi Kokuko KK (one aircraft only) Showa Hikoko KK (one aircraft only) Dai-Juichi Kaigun Kokusho (one aircraft only)	
Description	High-performance single-seater land-based interceptor fighter, used also in modified form as fighter-bomber	
Technical data:	1–J	2–J
Engine	1,990-h.p. Nakajima Homare 21 air-cooled radial	
Span	12 m (39 ft 4 in)	
Length	8·885 m (29 ft 2 in)	9·345 m (30 ft 8 in)
Height	4·06 m (13 ft 4 in)	3·96 m (13 ft)
Wing area	23·5 sq m (253 sq ft)	
Weight empty	2,987 kg (6,387 lb)	2,657 kg (5,858 lb)
Weight loaded	3,900 kg (8,598 lb)	4,000 kg (8,818 lb)
Crew	One	
Maximum speed	315 knots at 6,000 m (20,000 ft)	321 knots at 5,600 m (18,500 ft)
Cruising speed	200 knots at 2,000 m (6,500 ft)	200 knots at 3,000 m (10,000 ft)
Normal range	773 nautical miles	926 nautical miles
Maximum range	1,374 nautical miles	1,293 nautical miles
Service ceiling	12,500 m (41,000 ft)	10,700 m (35,000 ft)

30 Kawanishi N1K1-J Naval Interceptor Fighter *Shiden* (Violet Lightning). Developed from the N1K1 seaplane and code-named GEORGE, it was capable of well over 360 miles an hour in level flight. See also Colour Section (IV and V)

Bomb-load	N1K1–Jb could carry two bombs of up to 250-kg each; N1K1–Jc and N1K2–Ja could carry four
Armament	N1K1–J: Two 20-mm. Type 99 Model 2 cannon in wings, two in gondolas beneath wings, two 7·7-mm. Type 97 machine-guns mounted in fuselage N1K1–Ja, b and c and N1K2–J and Ja: Four 20-mm. Type 99 Model 2 cannon mounted in wings

The N1K1–J *Shiden*, or Violet Lightning, was developed by Kawanishi as a private venture. The design was based on that of the N1K1 seaplane, and was put in hand while the N1K1 was still on the drawing-board. A Nakajima Homare 11 engine (replaced in production models by a Nakajima Homare 21) was substituted for the less powerful Mitsubishi engine of the N1K1, and a retractable undercarriage for the floats. The prototype made its maiden flight on 27 December 1942. The naval authorities, at first sceptical but attracted by the prospect of meeting United States Hellcats and Corsairs on equal terms, encouraged the firm to improve on the prototype at the cost of suspending work on other land-based fighters. They also urged Kawanishi to hasten development of the N1K2–J, an advanced version which made so favourable an impression that orders were placed for production models before its service trials were completed. About 1,400 N1K1–Js and N1K2–Js, in addition to a few two-seater trainers, based on the N1K2–J and bearing the designation N1K2–K, were produced between 1943 and 1945. The N1K2–J could hold its own with the best and fastest American naval fighters, but was less successful against high-flying B–29 bombers because its speed and rate of climb fell off fairly rapidly at high altitudes. Arrangements were made to build or assemble N1K2–Js not only at Kawanishi's factories but also at factories owned or managed by other firms and at naval arsenals. Chiefly because deliveries of components were delayed by air attacks, none of the ancillary firms or arsenals succeeded in completing more than a few aircraft.

31 Kawasaki Ki-32 Army Type 98 Single-Engine Light Bomber. Old-fashioned in appearance and unarmoured, the Ki-32 proved unsuitable for use against well-defended objectives. The Allies called it MARY

Kawasaki Aircraft

Kawasaki Ki–10–I and Ki–10–II

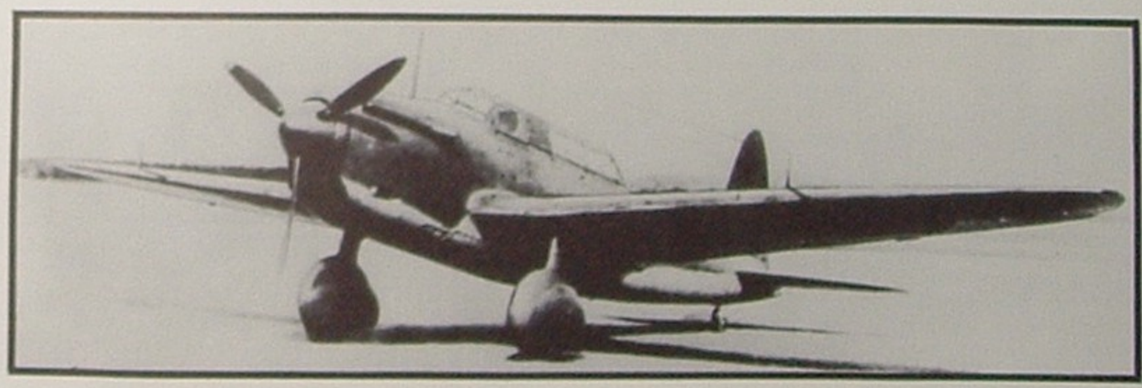
Official des.	Ki–10–I: Army Type 95 Fighter Model 1 Ki–10–II: Army Type 95 Fighter Model 2
Allied code name	Perry
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Single-seater biplane fighter with fixed undercarriage
Engine	850-h.p. Kawasaki Ha–9–IIa liquid-cooled V12
Span	Ki–10–1: 9·55 m (31 ft 4 in) Ki–10–II: 10·02 m (32 ft 11 in)
Length	Ki–10–I: 7·2 m (23 ft 7 in) Ki–10–II: 7·55 m (24 ft 9 in)
Height	3 m (9 ft 10 in)
Wing area	Ki–10–I: 20 sq m (215 sq ft) Ki–10–II: 23 sq m (248 sq ft)

Well-built, highly manoeuvrable biplane fighters with maximum speeds in the neighbourhood of 250 m.p.h. and capable of climbing to 16,000 feet in five minutes, the Ki–10–I and II did good service in their day, but had ceased to be used by first-line units when Japan went to war with the Western Powers in 1941. Production was terminated at the end of 1938 and thereafter most of the surviving aircraft were relegated to training units. During the Second World War they were, however, seen occasionally by Allied airmen in China, and were allotted a code name in the belief that some first-line squadrons were still equipped with them.

Kawasaki Ki–32

Official des.	Army Type 98 Single-Engine Light Bomber
Allied code name	Mary
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Light bomber of monoplane configuration with fixed spatted undercarriage
Engine	850-h.p. Army Type 98 (Kawasaki Ha–9–II) liquid-cooled V12
Span	15 m (49 ft 3 in)
Length	11·64 m (38 ft 2 in)
Height	2·9 m (9 ft 6 in)
Wing area	34 sq m (366 sq ft)
Weight empty	2,349 kg (5,179 lb)
Weight loaded	3,539 kg (7,802 lb)
Crew	Two
Maximum speed	423 km/h at 3,940 m (263 m.p.h. at 13,000 ft)
Cruising speed	300 km/h (186 m.p.h.)
Normal range	1,300 km (826 miles)
Maximum range	1,960 km (1,218 miles)
Service ceiling	8,900 m (29,000 ft)
Bomb-load	Normal: 300 kg; maximum: 450 kg
Armament	One forward-firing and one flexibly mounted, rearward-firing 7·7-mm. Type 89 machine-gun

The Ki–32 was designed to meet a specification of 1936 which called for a light bomber capable of carrying 300 to 450 kilograms of bombs. The prototype first flew in the spring of 1937, but production did not begin until more than fifteen months later. It ceased in the summer of 1940, after some 850 aircraft of the production series had been completed. Although encumbered by a fixed under-



32 Kawasaki Ki-45 Army Type 2 Two-Seater Fighter *Toryu* (Dragon-Killer). A brisk performer but not altogether at home in its ultimate role as a night-fighter, the Ki-45 was known to the Allies as NICK

carriage, the Ki-32 had a fair turn of speed, but it was poorly armed and its liquid-cooled engine, unprotected by armour, made it highly vulnerable. Ki-32s were still in service with first-line units in December 1941, but they were suitable for employment only where little or no fighter opposition could be expected. At Hong Kong on 8 December one such unit, the 45th Air Regiment, annihiliated the opposing air forces, but that was hardly surprising since these consisted only of three obsolete Vildebeeste torpedo-bombers and two Walrus amphibians. The Ki-32 was relegated soon afterwards to a training role.

Kawasaki Ki-45 KAI Dragon-Killer

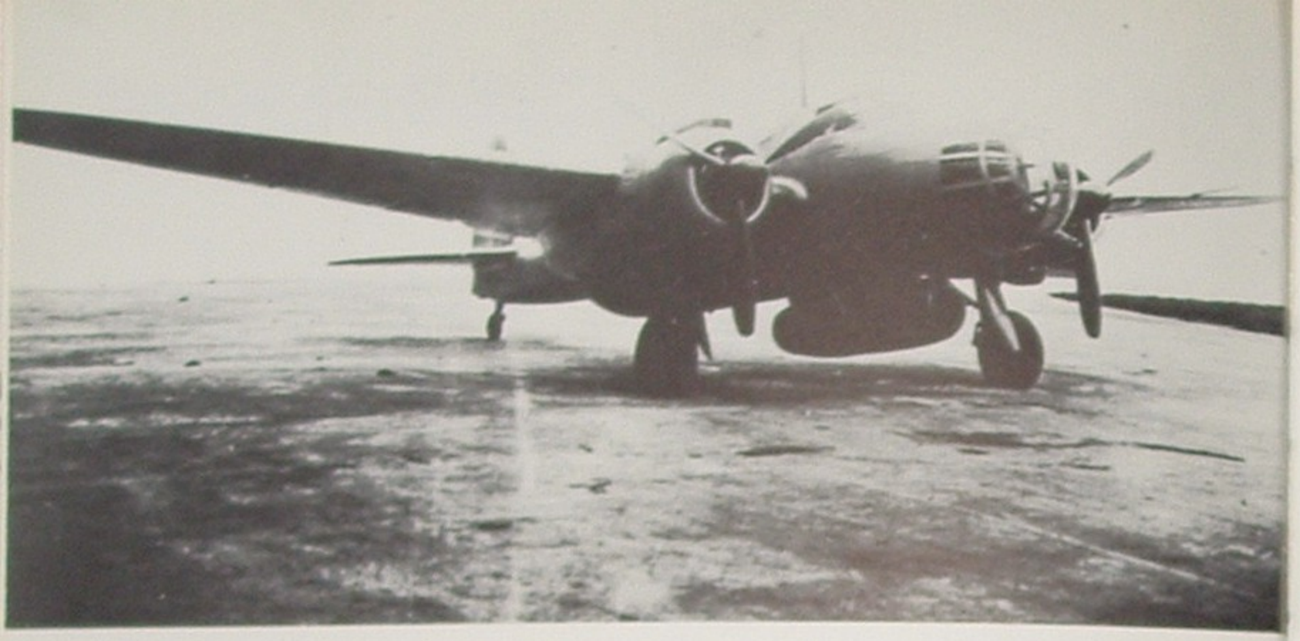
Official des. Army Type 2 Two-Seater Fighter Model A, B, C, D Dragon-Killer
Allied code name Nick
Manufacturer Kawasaki Kokuki Kogyo KK
Description Two-seater twin-engine mid-wing monoplane designed as heavy fighter but used in a variety of defensive and offensive roles
Engines Two 950-h.p. Army Type 99 (Nakajima Ha-25) or 1,050-h.p. Army Type 1 (Mitsubishi Ha-102) air-cooled radials
Span 15·02 m (49 ft 3 in)
Length 10·6 m (34 ft 9 in), increased in later models to 11 m (36 ft 1 in)
Height 3·7 m (12 ft 2 in)
Wing area 32 sq m (344 sq ft)
Weight empty 3,695 kg (8,146 lb), increased in later models to 4,000 kg (8,818 lb)
Weight loaded 5,276 kg (11,632 lb), increased in later models to 5,500 kg (12,125 lb)
Crew Two
Maximum speed Earlier models: 547 km/h at 7,000 m (340 m.p.h. at 23,000 ft)
Later models: 540 km/h at 6,000 m (335 m.p.h. at 20,000 ft)
Cruising speed Not known
Range Earlier models: 2,260 km (1,400 miles)
Later models: 2,000 km (1,240 miles)
Service ceiling Earlier models: 10,700 m (35,000 ft)
Later models: 10,000 m (33,000 ft)
Bomb-load Two 250-kg bombs could be carried

Armament	KAIa	KAIb	KAIc	KaId
7·92-mm. Type 98 mg	1	1	1 or nil	1
12·7-mm. Type 1 mg	2			
20-mm. Ho-3 cann.	1	1		1
20-mm. Ho-5 cann.			1	2
37-mm. Type 98 cann.		1		
37-mm. Ho-203 cann.			1	

The genesis of the Kawasaki *Toryu*, or Dragon-Killer, was an invitation issued by the military authorities to aircraft manufacturers in 1937 to submit proposals for a heavy fighter comparable with fast twin-engine aircraft under development in Europe and the United States. Nakajima, Kawasaki and Mitsubishi proposed aircraft to be called respectively the Ki-37, the Ki-38, and the Ki-39. Kawasaki then built a mock-up of the Ki-38, and the other proposals were dropped. After studying the mock-up, the authorities drafted a specification which Kawasaki adopted as the basis of an experimental prototype powered by two Bristol Mercury engines manufactured under licence by Nakajima and known in Japan as the Nakajima Ha-20b. Two more prototypes and six pre-production models of this aircraft, the Ki-45, were completed or put in hand, but the prototypes proved unsatisfactory, and towards the end of 1939 the project was shelved. In the following spring the authorities revived it. A new prototype with Nakajima Ha-25 engines, the Experimental Improved Type 1 Ki-45, was more successful, with the result that two more prototypes and five pre-production aircraft were ordered. In the meantime Takeo Doi, who was largely responsible for the design of the original Ki-45, worked out proposals for a redesigned version with a slimmer fuselage, a larger wing area and more hitting-power. These were accepted by the military authorities in October 1940, and a prototype of the redesigned aircraft was completed in the early summer of 1941. The outcome of extensive trials and the building of twelve pre-production aircraft and two more prototypes was that series production of the Ki-45 KAIa, or Army Type 2 Two-Seater Fighter Model A Dragon-Killer, began early in 1942. First-line units found it so useful in a ground-attack and anti-shipping role that a new version, the KAIb, was developed expressly for such tasks. Later, the Mitsubishi Ha-102 engine was adopted in place of the Nakajima Ha-25. Other versions of the KAI introduced before the end of the war included the KAIc, for night fighting, and the KAId cannon fighter for shipping strikes. Altogether, some 1700 aircraft of the a, b, c, and d series were completed between 1942 and the end of the war. Plans to equip all KAIcs with air-to-air radar were defeated by production difficulties after one aircraft had been so equipped.

Kawasaki Ki-48-I and Ki-48-II

Official des. Ki-48-I: Army Type 99 Twin-Engine Light Bomber Model 1A, 1B
Ki-48-II: Army Type 99 Twin-Engine Light Bomber Model 2A 2B, 2C
Allied code name Lily
Manufacturer Kawasaki Kokuki Kogyo KK
Description Four-seater light bomber of mid-wing monoplane configuration
Engines Two 950-h.p. Army Type 99 (Nakajima Ha-25) or 1,150-h.p. Army Type 1 (Nakajima Ha-115) air-cooled radials
Span 17·47 m (57 ft 4 in) (IIb, 17·45 m)
Length 48-I: 12·6 m (41 ft 4 in)
48-II: 12·75 m (41 ft 10 in)
Height 3·8 m (12 ft 6 in)
Wing area 40 sq m (431 sq ft)
Weight empty 48-I: 4,050 kg (8,929 lb)
48-II: 4,550 kg (10,031 lb)
Weight loaded 48-I: 5,900 kg (13,007 lb)
48-II: 6,500 kg (14,330 lb)
Crew Four
Maximum speed 48-I: 480 km/h at 3,500 m (300 m.p.h. at 11,500 ft)
48-II: 505 km/h at 5,600 m (314 m.p.h. at 18,000 ft)
Cruising speed 350 km/h at 3,500 m (217 m.p.h. at 11,500 ft)
Normal range 48-I: 1,980 km (1,230 miles)
48-II: 2,050 km (1,275 miles)
Maximum range 2,400 km (1,490 miles)
Service ceiling 48-I: 9,500 m (31,000 ft)
48-II: 10,000 m (33,000 ft)
Bomb-load 48-I: Normal, 300 kg; maximum, 400 kg
48-II: Normal, 400 kg; maximum, 800 kg
Armament Most models: Three flexibly mounted 7·7-mm. Type 89 machine-guns in forward, dorsal and ventral positions
Some late models: Two 7·7-mm. Type 89 machine-guns in forward position, one 12·7-mm. Type 1 machine-gun in dorsal position, one 7·7-mm. Type 89 machine-gun in ventral position



Like the British Blenheim, the German Ju 88 and the Russian Tupolev SB-2, the Ki-48 was designed as a day bomber fast enough to escape interception. As things turned out, the single-seater fighters in service by the time it was used in a major war could overhaul it without much difficulty. The Ki-48-II, although some fifteen miles an hour faster and quite well armoured by Japanese standards, also proved highly vulnerable. Nevertheless the authorities kept it in production until the latter part of 1944. By that time nearly 2,000 Ki-48-Is and IIs had been completed. They included a dive-bomber version, the IIb.

Kawasaki Ki-56

Official des.	Army Type 1 Freight Transport
Allied code name	Thalia
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Twin-engine transport aircraft of mid-wing monoplane configuration
Engines	Two 950-h.p. Army Type 99 (Nakajima Ha-25) air-cooled radials
Span	19·964 m (65 ft 6 in)
Length	14·9 m (48 ft 11 in)
Height	3·6 m (11 ft 10 in)
Wing area	51·2 sq m (551 sq ft)

While preparing in 1939 to build the Lockheed 14-WG3 transport aircraft under licence, Kawasaki planned a modified version with a better power-to-weight ratio and improved facilities for loading and unloading. The prototype was completed in November 1940, and production began in August 1941. About 120 Ki-56s were built between 1941 and 1943, when production ceased.

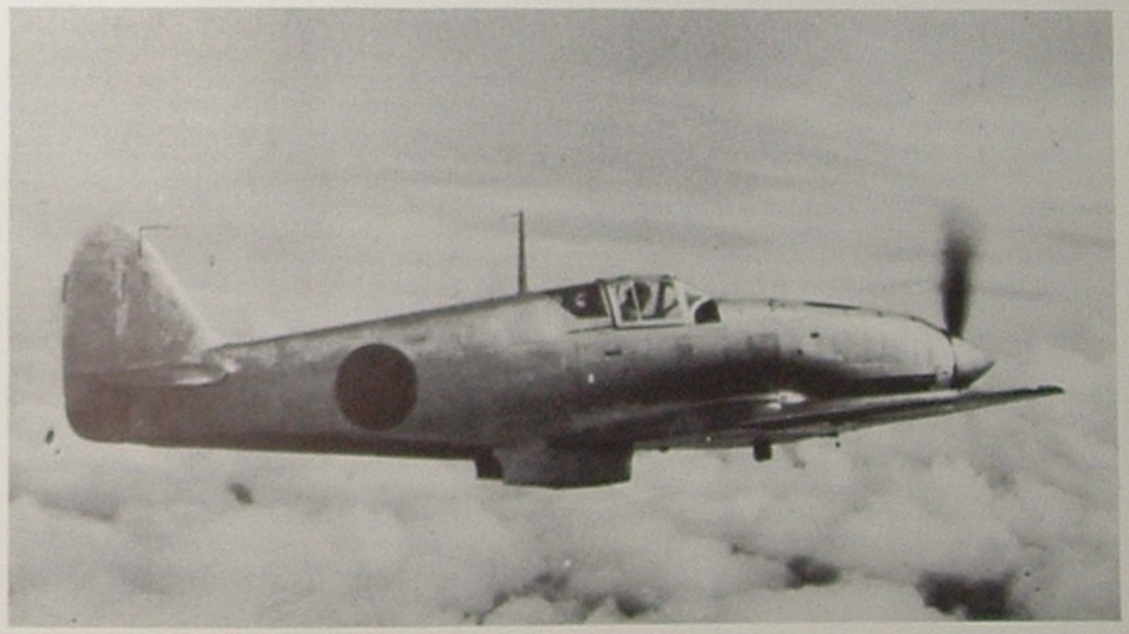
Kawasaki Ki-61 Swallow

Official des.	Ki-61-I: Army Type 3 Fighter Model 1A, 1B, 1C, 1D Ki-61-II KAI: Army Type 3 Fighter Model 2A, 2B
Allied code name	Tony
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Single-seater fighter of monoplane configuration with self-sealing fuel tanks and liquid-cooled engine protected by armour
Engine	61-I: 1,100-h.p. Army Type 2 (Kawasaki Ha-40) liquid-cooled inverted V12 61-II KAI: 1,500-h.p. Kawasaki Ha-140 liquid-cooled inverted V12
Span	12 m (39 ft 4 in)
Length	Ia, Ib: 8·75 m (28 ft 9 in) I KAIc: 8·94 m (29 ft 4 in) II KAI: 9·16 m (30 ft 1 in)
Height	3·7 m (12 ft 2 in)
Wing area	20 sq m (215 sq ft)
Weight empty	Ia, Ib: 2,210 kg (4,872 lb) I KAIc: 2,630 kg (5,798 lb) II KAI: 2,840 kg (6,261 lb)
Weight loaded	Ia, Ib: 2,950 kg (6,504 lb) I KAIc: 3,470 kg (7,650 lb) II KAI: 3,780 kg (8,333 lb)
Crew	One
Maximum speed	Ia, Ib: 592 km/h at 4,860 m (368 m.p.h. at 16,000 ft) I KAIc: 590 km/h at 4,260 m (366 m.p.h. at 14,000 ft) II KAI: 610 km/h at 6,000 m (380 m.p.h. at 20,000 ft)
Cruising speed	400 km/h at 4,000 m (250 m.p.h. at 13,000 ft)
Normal range	61-I: 600 m (373 miles) 61-II KAI: 1,100 km (684 miles)
Maximum range	Ia, Ib: 1,100 km (684 miles) I KAIc: 1,800 km (1,120 miles) II KAI: 1,600 km (995 miles)
Service ceiling	10,000 to 11,600 m (33,000 to 38,000 ft)
Bomb-load	Some models could carry two 250-kg bombs
Armament	Models 1A, 1B: Two fuselage-mounted 12·7-mm. Type 1 machine-guns and two wing-mounted 7·7-mm. Type 89 or 12·7-mm. Type 1 machine-guns or two 20-mm. Mauser cannon Models 1C, 1D, 2A, 2B: Two fuselage-mounted 12·7-mm. Type 1 machine-guns or 20-mm. Ho-5 cannon and two wing-mounted 12·7-mm. Type 1 machine-guns or 20-mm. Ho-5 or 30-mm. Ho-105 cannon

As holders of a licence to manufacture in Japan the Daimler-Benz DB 601A liquid-cooled engine, Kawasaki were invited in 1940 to design a heavy and a light fighter powered by it. The projected heavy fighter was afterwards dropped, but a Kawasaki-built DB 601A, the Ha-40, was completed in the summer of 1941 and a fast, single-seater fighter built round it was tested in December. Production began some twelve months later and the new aircraft – the Ki-61-I *Hien*, or Swallow – was introduced to active operations in New Guinea in April 1943. Its appearance was so markedly European that it was given the code name Tony in the belief that it was either a copy of an unknown Italian fighter or a version of the Messerschmitt (Bf) 109 built under licence. Well over 2,500 aircraft of the Ki-61-I and Ki-61-I KAI series, the latter a modified version with strengthened wings, were manufactured between August 1942 and January 1945. Meanwhile a new version of the Ha-40 engine, the Ha-140, was used to power the Ki-61-II, an unsuccessful development of the Ki-61 which did not get beyond the prototype stage. A modified Ki-61-II, the Ki-61-II KAI, was then introduced, but only a few aircraft of this series were completed to the original specification.

33 (Left) Kawasaki Ki-48 Army Type 99 Twin-Engine Light Bomber. A fast bomber broadly comparable with the British Blenheim and the Russian Tupolev SB-2, the Ki-48 was manufactured in substantial numbers between the summer of 1940 and the autumn of 1944. The Allies called it LILY

34 (Below) Kawasaki Ki-61 Army Type 3 Fighter *Hien* (Swallow). Known to the Allies as TONY, the Ki-61 in its final form could reach nearly 380 miles an hour in level flight. See also Colour Section (I)



35 Kawasaki Ki-100 Army Type 5 Fighter. Essentially, the Ki-100 consisted of a Ki-61 airframe modified to accept a radial engine. It received no Allied code name

Kawasaki Ki–100

Official des.	Army Type 5 Fighter Model 1A, 1B
Allied code name	None
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Single-seater high-altitude fighter of low-wing monoplane configuration derived from Ki–61
Engine	1,500-h.p. Mitsubishi Ha–112–II air-cooled radial
Span	12 m (39 ft 4 in)
Length	8·82 m (28 ft 11 in)
Height	3·75 m (12 ft 4 in)
Wing area	20 sq m (215 sq ft)
Weight empty	2,525 kg (5,567 lb)
Weight loaded	3,495 kg (7,705 lb)
Crew	One
Maximum speed	580 km/h at 6,000 m (360 m.p.h. at 19,500 ft) (at 10,000 m 535 km/h or 332 m.p.h.)
Cruising speed	400 km/h at 4,000 m (250 m.p.h. at 13,000 ft)
Range	Normal: 1,400 km (870 miles) With drop-tanks: 2,200 km (1,367 miles)
Bomb-load	Two 250-kg bombs could be carried in place of drop-tanks
Armament	Two fuselage-mounted 20-mm. Ho–5 cannon and two wing-mounted 12·7-mm. Type 1 machine-guns

When B–29 bombers based in India began, in the summer of 1944, to make high-level attacks on objectives in Japan after refuelling in China, the Japanese Army Air Force had no aircraft capable of intercepting and destroying them, although its intelligence officers had known for some months that runways at airfields near Calcutta and at Chengtu, in China, were being lengthened to accommodate American bombers of exceptional range. The Ki–61–II was endowed, in theory, with the necessary high-altitude performance, but it was still in the prototype stage, and the authorities despaired of bringing it into service in time to save the situation unless a more reliable power-unit than the Ha–140 could be found for it. After studying the Focke-Wulf Fw 190, Kawasaki's engineers succeeded in marrying the tubby Mitsubishi Ha–112–II radial engine to the slim fuselage of the Ki–61. Of some 375 Ki–61–II KAI airframes produced between the following September and the end of the war, 275 were fitted with Mitsubishi engines and completed as high-altitude interceptors. Three were used as prototypes with the designation Ki–100, the rest treated as production aircraft and given the designation Ki–100–Ia or Army Type 5 Fighter Model 1A. In addition, about a hundred Ki–100s were manufactured from scratch and received the designation Ki–100–Ib or Army Type 5 Fighter Model 1B. A version powered by a turbosupercharged variant of the Ha–112–II and given the designation Ki–100–II was projected, but did not get beyond the prototype stage. The Ki–100 could climb to 10,000 metres in twenty minutes and was a brisk performer at such altitudes, but its armament left a good deal to be desired and many of the pilots who handled it had very little operational experience.

36 Kawasaki Ki-102 Army Type 4 Assault Aircraft. A fast and formidable battlefield aircraft, the Ki-102 was produced in numbers too small for it to have any significant effect on the outcome of the war. The Allied code name was RANDY

Kawasaki Ki–102

Official des.	Army Type 4 Assault Aircraft
Allied code name	Randy
Manufacturer	Kawasaki Kokuki Kogyo KK
Description	Two-seater twin-engine mid-wing monoplane used in small numbers as ground-attack aircraft and intended also for use as high-altitude interceptor and as night fighter
Engines	Two 1,500-h.p. Army Type 4 (Mitsubishi Ha–112–II) air-cooled radials
Span	15·57 m (51 ft 1 in)
Length	11·45 m (37 ft 7 in)
Height	3·7 m (12 ft 2 in)
Wing area	34 sq m (366 sq ft)
Weight empty	4,950 kg (10,913 lb)
Weight loaded	7,300 kg (16,094 lb)
Crew	Two
Maximum speed	580 km/h at 6,000 m (360 m.p.h. at 20,000 ft)
Cruising speed	Not known
Range	2,000 km (1,243 miles)
Service ceiling	10,000 m (33,000 ft)
Bomb-load	Two 250-kg bombs
Armament	One 57-mm. Ho–401 cannon in the nose, two 20-mm. Ho–5 cannon in ventral position, one flexibly mounted 12·7-mm. Type 1 machine-gun firing to the rear

In the late summer of 1943 the military authorities accepted a proposal from Takeo Doi that a ground-attack version of the Kawasaki Ki–96 heavy fighter, then under development but not destined to go into production, should be built as a successor to versions of the Ki–45 employed in that role. The prototype first flew in the following March, and in October the aircraft went into production as the Ki–102b, or Army Type 4 Assault Aircraft. Rather more than 200 aircraft of this series were completed. Some took part in the spring and summer of 1945 in the defence of Okinawa, others were used for experimental purposes. A high-altitude interceptor version, the Ki–102a, was projected, as was a night-fighter version, the Ki–102c. Neither got much beyond the prototype stage, but some twenty or more pre-production aircraft of the Ki–102a series were built and fifteen of these were delivered. They were armed with 37-mm. Ho–203 and 20-mm. Ho–5 cannon and powered by Ha–112–II Ru engines with turbosuperchargers. In addition, experiments were made with a pressure-cabin version of the Ki–102b, powered by the Ha–112–II Ru engine and designated the Kawasaki Ki–108, but the two prototypes were still under trial when the war ended.

37 Kokusai Ki-76 Army Type 3 Command Reconnaissance Aircraft. A Japanese counterpart of the German *Storch*, the Ki-76 was known to the Allies as STELLA. The photograph shows a partially dismantled specimen

Kayaba Ka-1

Official des.	Army Model 1 Observation Autogyro
Allied code name	None
Manufacturer	K.K. Kayaba Seisakusho
Description	Two-seater autogyro intended for artillery reconnaissance and used also as shipborne submarine-spotter
Engine	240-h.p. Argus As 10c air-cooled inverted V8, built under licence
Rotor diameter	12·2 m (40 ft)
Length	9·2 m (30 ft 2 in)
Weight empty	775 kg (1,709 lb)
Weight loaded	1,170 kg (2,579 lb)
Crew	Two
Maximum speed	165 km/h (103 m.p.h.)
Cruising speed	115 km/h (72 m.p.h.)
Range	280 km (174 miles)
Service ceiling	3,500 m (11,500 ft)
Bomb-load	Two 60 kg depth charges could be carried but aircraft then became single-seater
Armament	None

In 1939 the military authorities imported an American-built Kellett KD-1A autogyro with the intention of using it for artillery reconnaissance. While being tried out it was irreparably damaged. The authorities delivered the wreckage to KK Kayaba Seisakusho, a small firm with an interest in research, and told them to build a similar machine. A prototype was completed in the spring of 1941 and made its maiden flight on 26 May. About 240 aircraft of the production series were afterwards completed. Spotting for gunners was their usual role, but when the military authorities found that the navy could no longer protect the army's external lines of communication and began to organize their own convoys, the Ka-1 was chosen to fly anti-submarine patrols from a merchant vessel transformed into an escort carrier. The observer had then to be left behind so that two depth charges could be carried. Two experimental versions, the Ka-1 KAI and the Ka-2, were built, but neither went into production.

Kokusai Aircraft

Kokusai Ki-59

Official des.	Army Type 1 Transport Aircraft
Allied code name	Theresa
Manufacturer	Nippon Kokusai Koku Kogyo KK
Description	Light transport and communications aircraft of high-wing monoplane configuration
Engines	Two 450-h.p. Army Type 98 (Hitachi Ha-13a) air-cooled radials
Span	17 m (55 ft 9 in)
Length	12·5 m (41 ft)
Height	3·05 m (10 ft)
Wing area	38·4 sq m (413 sq ft)

Nippon Kokusai Koku Kogyo KK, more often known as Kokusai, was a small company formed in 1941 by the amalgamation of two even smaller firms, Nippon Koku Kogyo KK and Kokusai Kokuki KK. In 1937 and 1938 Nippon Koku Kogyo designed and built in prototype form for the Ministry of Communications a light transport aircraft, but its performance did not satisfy the ministry. The military authorities afterwards ordered a version powered by different engines, and this proved satisfactory. In 1941 it was put into production as the Ki-59 or Army Type 1 Transport Aircraft. Nippon Kokusai Koku Kogyo built about sixty aircraft of the production series before the Ki-59 was superseded by the Tachikawa Ki-54c.

Kokusai Ki-76

Official des.	Army Type 3 Command Liaison Aircraft
Allied code name	Stella
Manufacturer	Nippon Kokusai Koku Kogyo KK
Description	Two-seater army co-operation aircraft of parasol-wing monoplane configuration used for artillery reconnaissance, as communications aircraft and as shipborne submarine-spotter
Engine	310-h.p. Hitachi Ha-42 air-cooled radial
Span	15 m (49 ft 3 in)
Length	9·56 m (31 ft 4 in)
Height	2·9 m (9 ft 6 in)
Wing area	29·4 sq m (316 sq ft)

A Japanese counterpart of the Fieseler Fi 156 *Storch*, the Kokusai Ki-76 made its first flight in prototype form in May 1941, and went into production in November. From the latter part of 1943 it was used not only as an artillery reconnaissance and communications aircraft but also, in modified form, to make anti-submarine patrols from the deck of a former merchant vessel employed as an escort carrier. In the last of these roles, it carried two 60 kg depth charges. The Ki-76 had a maximum speed of nearly 180 kilometres or roughly 110 miles an hour and could reach an altitude of more than 5,600 metres or approximately 18,500 feet. Its theoretical range in still air was 750 kilometres or just under 470 miles. Production continued until 1944.

Kokusai Ki–86

See Appendix, Bücker Bü 131

Kokusai Ki–105 Phoenix

Official des.	Army Experimental Transport Aircraft Phoenix
Allied code name	None
Manufacturer	Nine prototype aircraft built by Nippon Kokusai Koku Kogyo KK
Description	Powered version of Kokusai Ku–7 glider intended for carriage of fuel
Engines	Two 940-h.p. Mitsubishi Ha–26–II air-cooled radials
Span	35 m (114 ft 10 in)
Length	19·92 m (65 ft 4 in)
Cruising speed	220 km/h (137 m.p.h.)
Maximum range	2,500 km (1,553 miles)

The Kokusai Ki–105 *Ohtori*, or Phoenix, first called the Ku–7–II, was a powered version of the Kokusai Ku–7 glider, developed during the last few months of the war for the purpose of carrying desperately needed supplies of oil from Sumatra to Japan. Nine prototypes were tested, and plans were made to produce 300 aircraft.

Kokusai Ku–7 Crane

Official des.	Army Experimental Transport Glider Crane
Allied code name	None
Manufacturer	Experimental version built by Nippon Kokusai Koku Kogyo KK
Description	Large twin-boom high-wing monoplane towed glider with wheels
Span	35 m (114 ft 10 in)
Length	19·92 m (65 ft 4 in)

The largest glider built in Japan during the Second World War, the Ku–7 *Manazuru*, or Crane, was designed to carry up to thirty-two troops or an 8-ton tank, and to be towed by a Mitsubishi Ki–67 or a Nakajima Ki–49 bomber. It was tested in the late summer of 1944, but did not go into production.

Kokusai Ku–8–II

Official des.	Army Type 4 Large Transport Glider
Allied code name	Gander (formerly Goose)
Manufacturer	Nippon Kokusai Koku Kogyo KK
Description	Large towed glider consisting of modified Ki–59 transport aircraft with engines removed and under-carriage replaced by skids
Span	23·2 m (76 ft 1 in)
Length	13·31 m (43 ft 8 in)

Soon after the outbreak of war with the Western Powers, the engines were removed from a Kokusai Ki–59 transport aircraft and the airframe was tested as a prototype glider with the designation Ku–8–I. A modified version was put into production as the Ku–8–II or Army Type 4 Large Transport Glider. Up to twenty soldiers or a mountain gun with its crew could be carried, and the glider could be towed at speeds of the order of 220 kilometres an hour by a Mitsubishi Ki–21–II bomber or similar aircraft. The Ku–8–II was the only Japanese transport glider met in combat by Allied forces.

Kyushu and Watanabe Aircraft

Kyushu J7W1 Magnificent Lightning

Official des.	Naval Experimental 18–Shi Otsu (B) Type Interceptor Fighter
Allied code name	None
Manufacturers	Kyushu Hikoki KK (formerly KK Watanabe Tekkosho) Nakajima Hikoki KK
Description	Single-seater canard-type low-wing monoplane intended as high-altitude interceptor
Engine	2,130-h.p. Mitsubishi MK9D air-cooled radial driving pusher airscrew
Span	11·114 m (36 ft 6 in)
Length	9·66 m (31 ft 8 in)
Height	3·92 m (12 ft 10 in)
Wing area	20·5 sq m (221 sq ft)
Weight empty	3,645 kg (7,639 lb)
Weight loaded	4,928 kg (10,854 lb)
Crew	One
Maximum speed	405 knots at 8,700 m (28,500 ft)
Cruising speed	228 knots at 4,000 m (13,000 ft)
Range	460 nautical miles

38 Kyushu Q1W Naval Patrol Aircraft *Tokai* (Eastern Sea). Code-named LORNA, the Q1W was used in the latter part of the war to protect convoys carrying raw materials to Japan from Malaya and the Netherlands East Indies

Service ceiling	12,000 m (39,000 ft)
Bomb-load	Two 60 kg or four 30 kg bombs could be carried
Armament	Four 30-mm. Type 5 cannon in the nose

Captain Masaoki Tsuruno, of the Imperial Japanese Navy, proposed in 1943 or earlier a high-altitude fighter of canard configuration, to be powered initially by a radial engine and ultimately by a turbojet. Tests were made with wooden gliders, and in the summer of 1944 Kyushu were instructed to design such an aircraft in association with a team of naval experts led by Tsuruno himself. A prototype was completed by the spring of 1945. A pusher airscrew aft of the fuselage, fin-and-rudder assemblies attached to swept-back wings, and horizontal control surfaces to port and starboard of the nose gave it, to a marked degree, the air of flying tail-first which is so disconcerting an attribute of canard-type aircraft. The authorities, eager to see the J7W in service, gave orders for production to begin before the prototype made the first of three short flights. An output of 150 aircraft a month from two factories was envisaged, but the war ended before even the first batch could be completed.

Kyushu K9W1 Maple

See Appendix, Bücker Bü 131

Kyushu K10W1

See Appendix, North American NA–16–4R

Kyushu K11W White Chrysanthemum

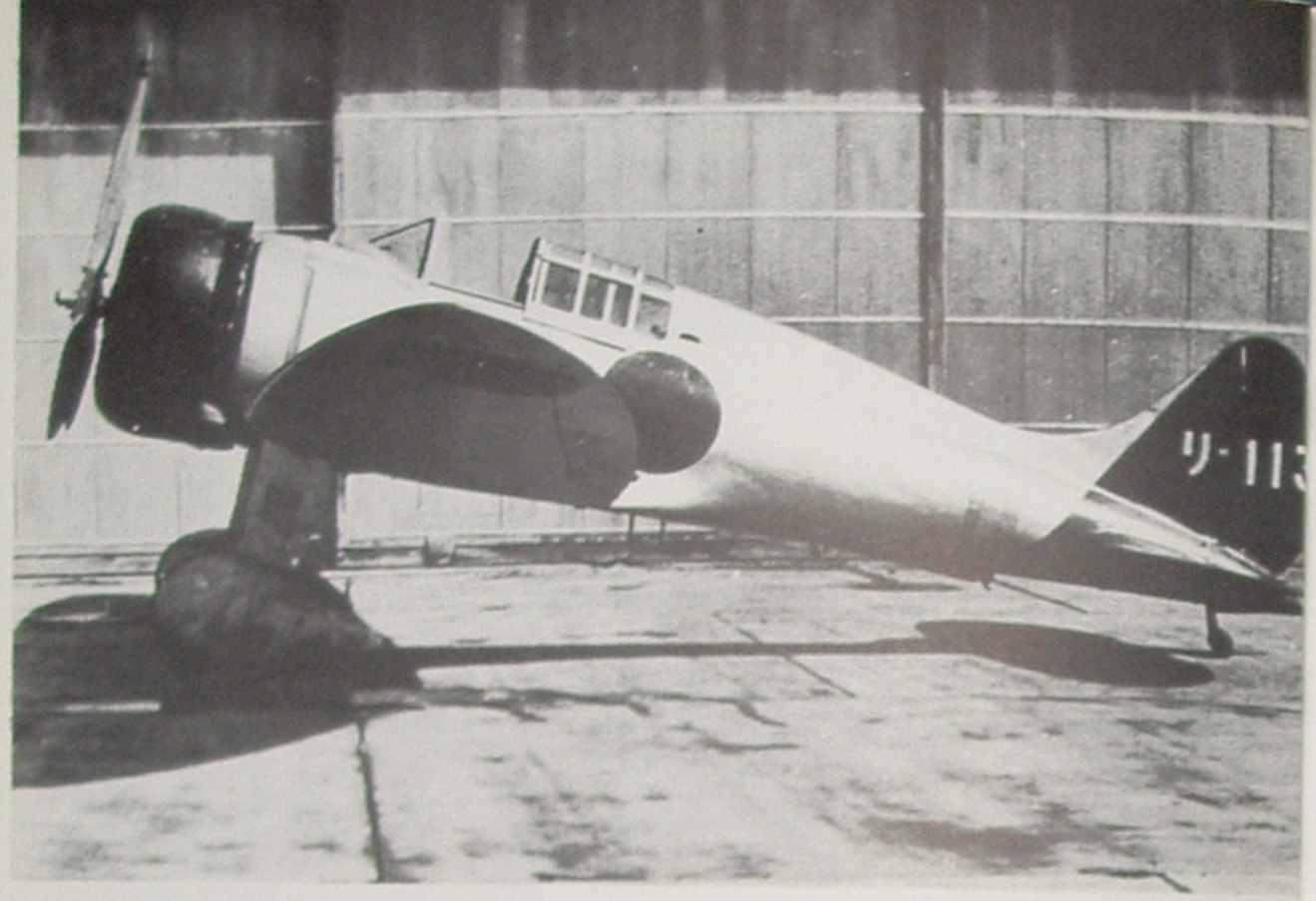
Official des.	Naval Operational Trainer White Chrysanthemum Model 11
Allied code name	None
Manufacturer	Kyushu Hikoki KK (formerly KK Watanabe Tekkosho)
Description	Five-seater single-engine mid-wing monoplane used to train bomber crews
Engine	515-h.p. Hitachi GK2B Amakaze 21 air-cooled radial
Span	14·98 m (49 ft 2 in)
Length	10·24 m (33 ft 7 in)
Height	3·93 m (12 ft 11 in)
Wing area	30·5 sq m (328 sq ft)

The prototype Kyushu *Shiragiku*, or White Chrysanthemum, made its first flight in November 1942. Nearly 800 aircraft of the production series were built between 1942 and 1945. Maximum speed was 124 knots at 1,700 metres (5,500 feet) and one 7·7-mm. Type 92 machine-gun and two 30-kg practice bombs were carried. K11Ws despatched towards the end of the war on suicide missions carried one 250-kg bomb.

Kyushu Q1W Eastern Sea

Official des.	Naval Patrol Aircraft Eastern Sea Model 11
Allied code name	Lorna
Manufacturer	Kyushu Hikoki KK (formerly KK Watanabe Tekkosho)
Description	Twin-engine convoy-protection aircraft of low-wing monoplane configuration
Engines	Two 610-h.p. Hitachi GK2C Amakaze 31 air-cooled radials
Span	16 m (52 ft 6 in)
Length	12·085 m (39 ft 8 in)
Height	4·118 m (13 ft 6 in)
Wing area	38·2 sq m (411 sq ft)

The Kyushu *Tokai*, or Eastern Sea, was designed to meet a specification of 1942 which called for a relatively slow patrol aircraft capable of spotting and destroying submarines at a considerable distance from the shore. The prototype was completed in 1943 and roughly 150 aircraft of the production series were built between the spring of 1944 and the end of the war. The *Tokai* had a maximum speed of 174 knots at 1,340 metres or roughly 4,400 feet, could cruise for five to six hours at 1,000 metres without refuelling, and carried two 250-kg bombs or an equivalent weight of depth charges. Enclosed cockpits provided accommodation for a crew of three or four. It was armed with one, or sometimes two, forward-firing 20-mm. Type 99 cannon, but its ceiling of less than 4,500 metres and single rearward-firing 7·7-mm. machine-gun made it highly vulnerable to Allied fighters.



Mitsubishi Aircraft

Mitsubishi A5M4

Official des.	Naval Type 96 Carrier-borne Fighter Model 4 (later called Model 24)
Allied code name	Claude (also Sandy)
Manufacturers	Mitsubishi Jukogyo KK KK Watanabe Tekkosho Dai-Nijuichi Kaigun Kokusho
Description	Single-seater carrier-borne fighter of low-wing monoplane configuration with fixed spatted undercarriage
Engine	785-h.p. Nakajima Kotobuki 41 or 41 KAI air-cooled radial
Span	11 m (36 ft 1 in)
Length	7·565 m (24 ft 10 in)
Height	3·27 m (10 ft 9 in)
Wing area	17·8 sq m (192 sq ft)
Weight empty	1,216 kg (2,681 lb)
Weight loaded	1,671 kg (3,684 lb)
Crew	One
Maximum speed	235 knots at 3,000 m (10,000 ft)
Range	648 nautical miles
Service ceiling	9,800 m (32,000 ft)
Bomb-load	Two 30-kg bombs could be carried
Armament	Two fuselage-mounted 7·7-mm. Type 89 machine-guns

The Mitsubishi A5M4 and its two-seater training variant, the A5M4-K, were the last of a series of A5M fighters which began with a prototype of inverted gull-wing configuration tested in 1935. Production models had wings with marked dihedral outboard of the undercarriage and a flat central section. Two versions intended for the army air force, the Ki-18 and the Ki-33, were built in prototype form but did not go into production. When Japan went to war with the Western Powers, all versions of the A5M had been discarded by first-line units except the A5M4, which still formed part of the equipment of the light fleet carriers *Zuiho*, *Hosho*, and *Ryujo*. The *Zuiho* and the *Hosho* were attached to the Combined Fleet for training and the *Ryujo* was serving with Vice-Admiral N. Kondo's Southern Force. So far as is known, fighters from the *Ryujo* which attacked an American seaplane tender off Davao in the early hours of 8 December 1941, were the only A5Ms used by first-line units against the Allies during the Second World War. Some aircraft from training units did, however, take part in suicide attacks on Allied warships in 1945.

39 Mitsubishi A5M2b Naval Type 96 Carrier-borne Fighter Model 2-2. The model shown (with enclosed cockpit) was succeeded by an open cockpit version which in turn gave place to the A5M4, known to the Allies as CLAUDE and widely believed on the outbreak of war to be the Japanese navy's standard carrier-borne fighter

Mitsubishi A6M Zero Fighter

Official des.	Naval Type O Carrier-borne Fighter Model 11, 21, 32, 22, 22A, 52, 52A, 52B, 52C, 53C, 63
Allied code name	Model 32: Zeke 32, formerly Hap or Hamp Other models: Zeke
Manufacturers	Mitsubishi Jukogyo KK Nakajima Hikoki KK
Description	Single-seater carrier-borne or land-based fighter of low-wing monoplane configuration with retractable undercarriage
Engine	A6M2: 950-h.p. Nakajima Sakae 12 air-cooled radial A6M3, 5, 5a, 5b, 5c: 1,130-h.p. Nakajima Sakae 21 air-cooled radial A6M6c, 7: 1,130-h.p. Nakajima Sakae 31 air-cooled radial
Span	A6M2 Model 11: 12 m (39 ft 4 in) A6M2 Model 21: 12 m (39 ft 4 in) with folding wing-tips extended Later models: 11 m (36 ft 1 in)
Length	Earlier models: 9·06 m (29 ft 9 in) Later models: 9·121 m (29 ft 11 in)
Height	A6M2: 3·05 m (10 ft) Later models: 3·509 m (11 ft 6 in)
Wing area	Early models: 22·4 sq m (242 sq ft) Model 32: 21·5 sq m (232 sq ft) Later models: 21·3 sq m (229 sq ft)
Weight empty	Early models: 1,680 kg (3,704 lb) Model 32: 1,807 kg (3,984 lb) Later models: 1,876 kg (4,136 lb)
Weight loaded	Early models: 2,410 kg (5,313 lb) Model 32: 2,544 kg (5,609 lb) Later models: 2,733 kg (6,025 lb)
Crew	One
Maximum speed	Early models: 288 knots at 4,500 m (15,000 ft) Model 32: 295 knots at 6,000 m (20,000 ft) Later models: 305 knots at 6,000 m (20,000 ft)
Cruising speed	Early models: 180 knots at 5,500 m (18,000 ft) Later models: 200 knots at 5,500 m (18,000 ft)
Normal range	1,010 nautical miles
Range with drop-tanks	A6M2: 1,675 nautical miles Model 32: 1,284 nautical miles A6M5, A6M6: 1,037 nautical miles A6M7: Not known. Drop tanks held more than twice as much fuel as those carried by earlier models
Service ceiling	Early models: 10,000 m (33,000 ft) Model 32: 11,000 m (36,000 ft) Later models: 11,700 m (38,500 ft)
Bomb-load	A6M7 could carry one 500-kg bomb; other models, two 60-kg bombs
Armament	A6M2, A6M3, A6M5 (except A6M5b and c and night-fighter version): Two fuselage-mounted 7·7-mm. Type 97 machine-guns and two wing-mounted 20-mm. Type 99 or (rarely) 30-mm. cannon A6M5 night-fighter: Additional fuselage-mounted 20-mm. Type 99 cannon firing at angle to line of flight A6M5b: One fuselage-mounted 7·7-mm. Type 97 machine-gun, one fuselage-mounted 13·2-mm. Type 3 machine-gun, two wing-mounted 20-mm. Type 99 cannon A6M5c, A6M6c, A6M7: Two wing-mounted and one fuselage-mounted 13·2-mm. Type 3 machine-guns, two wing-mounted 20-mm. Type 99 cannon

The phenomenally successful A6M originated with a specification of 1937 which called for a carrier-borne fighter of high performance to succeed the A5M. An amended specification was issued about five months after the first. A prototype designed by a team led by Jiro Horikoshi made its maiden flight on 1 April 1939. It passed all its tests except that it was too slow. The 780-horse-power Mitsubishi Zuisei engine was therefore replaced by a Nakajima Sakae 12, and in 1940 the aircraft was put into production as the A6M2 or Naval Type O Carrier-borne Fighter Model 11. It was known to Japanese airmen as the *Rei Sentoki*, or Zero Fighter, a term commonly abbreviated to *Reisen*. The Model 11 was soon replaced by Model 21, with folding wing-tips. A6M2s were first used operationally in China, and in the summer of 1941 the British authorities in

40 (Below) Mitsubishi A6M Naval Type O Carrier-borne Fighter. Known to Japanese airmen as the *Reisen (Rei Sentoki*, or Zero Fighter), this was the aircraft which opened the eyes of the world to the capabilities of the Japanese aircraft industry when it came into prominence at Pearl Harbor. The Allies adopted the official code name ZEKE but commonly referred to the aircraft as a Zero
41 (Above) A wrecked Mitsubishi A6M photographed at Munda in the Central Solomons

Singapore received an account of the armament and fuel capacity of one shot down in May. A fairly accurate estimate of performance followed in September. The information was transmitted to Headquarters, Air Command, Far East, where it was filed and forgotten. When the A6M2 was used against the Western Allies in December, its speed, range and manoeuvrability took them by surprise. During the first six months of the war the A6M2s of the Striking Force and the Eleventh Air Fleet were more than a match for most of the fighters the Western Allies could use against them, but they failed at the Battle of Midway Island in June 1942 to save the carrier force from a calamitous defeat. Thereafter the A6M lost its ascendancy, but it remained a formidable weapon and was produced in larger numbers than any other Japanese aircraft. There is some disagreement as to the number produced, but the best evidence available suggests that Mitsubishi built some three to four thousand and Nakajima between six and seven thousand. The following versions were built, some only in prototype form:

A6M1
Prototype first tested 1 April 1939. Mitsubishi Zuisei 13 engine.

A6M2, Model 11
Prototype first tested 28 December 1939; accepted for production 31 July 1940. 950-horse-power Nakajima Sakae 12 engine. Sixty-five aircraft built.

A6M2, Model 21
Similar to Model 11, but wing-tips folded so that aircraft would fit into lifts of carriers. Main production version of A6M2.

42 (Centre) Mitsubishi A6M5 Naval Type O Carrier-borne Fighter Model 52. An advanced version of the A6M with strengthened wings, the Model 52 could be dived at speeds in excess of 400 miles an hour
43 (Below) Mitsubishi A6M3 Naval Type O Carrier-borne Fighter Model 32. This was the version of the A6M known to the Allies at first as HAP or HAMP and later as ZEKE 32. The photograph shows a captured example with British markings

A6M3
Prototype first tested 1941. After first few aircraft built, folding wing-tips omitted and aircraft designated Model 32. Nakajima Sakae 21 engine. Used in South-West Pacific Area from late spring of 1942.

A6M4
Experimental version of A6M2, powered by turbo-supercharged engine. Not put into production.

A6M5
A6M3 with modified wings. Span 11 metres, wing area 21·3 square metres. Reached 351 miles an hour in level flight, 410 miles an hour in dive. Production version designated Model 52. In service from autumn 1943.

A6M5a
A6M5 with strengthened wings. Reached 460 miles an hour in dive. In production as Model 52A from spring 1944.

A6M5b
Improved version of A6M5a with better protection for pilot and fuel tanks and more powerful armament. Introduced 1944 as Model 52B.

A6M5c
Prototype first tested September 1944. Stronger armament, armour behind pilot's seat and other modifications. Put into production as Model 52C, but only about a hundred aircraft built.

A6M5d–S
Unofficial designation of night-fighter version of A6M5. Additional 20-millimetre cannon.

A6M6c
Version of A6M5c powered by Nakajima Sakae 31 engine with water-methanol injection. Self-sealing fuel tanks. Manufactured by Nakajima as Model 53C.

A6M7
Dive-bomber version of A6M6c with special bomb-rack and increased fuel capacity. In production from May 1945, as Model 63.

A6M8
Prototype completed April 1945. Redesigned A6M with 1,560-h.p. Mitsubishi Kinsei 62 engine. Large-scale production ordered, but no aircraft of production series completed by end of war.

44 & 45 Side and front views of Mitsubishi F1M Naval Type O Reconnaissance Seaplane. Code-named PETE, it was used not only for short-range reconnaissance but also as a fighter and dive-bomber, and for anti-submarine and counter-invasion patrols

Mitsubishi A7M2 Hurricane

Official des.	Naval Carrier-borne Fighter Hurricane Model 22
Allied code name	Sam
Manufacturer	Mitsubishi Jukogyo KK
Description	Single-seater carrier-borne fighter of low-wing monoplane configuration
Engine	2,200-h.p. Mitsubishi MK9A air-cooled radial
Span	14 m (45 ft 11 in)
Length	11 m (36 ft 1 in)
Height	4·28 m (14 ft 1 in)
Wing area	30·9 sq m (332 sq ft)
Weight empty	3,226 kg (7,112 lb)
Weight loaded	4,720 kg (10,406 lb)
Crew	One
Maximum speed	339 knots at 6,600 m (21,650 ft)
Cruising speed	225 knots at 4,000 m (13,000 ft)
Range	An endurance of 2½ hours at 250 knots and an additional half hour at full rated power was specified
Service ceiling	10,900 m (35,750 ft)
Bomb-load	Two 250-kg bombs could be carried in place of drop-tanks
Armament	Four wing-mounted 20-mm. Type 99 Model 2 cannon

The Mitsubishi A7M *Reppu*, or Hurricane, was intended as a successor to the A6M Zero Fighter. The project was first discussed in 1940, but was shelved because Mitsubishi's experts were pre-occupied with improved versions of existing aircraft. It was revived in 1942. The specification then issued called for a cannon fighter with a maximum speed of 345 knots, capable of climbing to 6,000 metres in less than six minutes. Jiro Horikoshi of Mitsubishi calculated that this performance would be attainable only with an engine of the calibre of the Mitsubishi MK9A or 9B, but the naval authorities ruled in favour of the less powerful Nakajima Homare 22. A prototype A7M1 was completed in the spring of 1944. It handled well, but fulfilled Horikoshi's prediction by attaining a maximum speed of only some 305 knots and taking more than ten minutes to reach 6,000 metres. The forward part of the fuselage was then redesigned to accommodate the Mitsubishi MK9A, and a prototype A7M2 made its first flight in October. Its performance was so satisfactory that plans were made to put it into production without delay. These were, however, thrown into disarray by an earthquake at Nagoya and by air attacks which damaged the factory in which the MK9A engine was made. To make matters worse, one of nine prototype or pre-production aircraft crash-landed and at least three were destroyed by bombing. The result was that only one aircraft of the production series was completed by the end of the war. A land-based version, to be called the A7M3–J, or Model 34, was projected, as was a version to be powered by a MK9C engine with mechanically-driven three-stage supercharger, but no prototype of either aircraft was completed.

Mitsubishi B5M1

Official des.	Naval Type 97 Carrier-borne Attack-Bomber Model 2
Allied code name	Kate 61 (formerly Mabel)
Manufacturer	Mitsubishi Jukogyo KK
Description	Three-seater low-wing monoplane intended as carrier-borne and land-based bomber and torpedo-bomber but used only from land bases
Engine	1,000-h.p. Mitsubishi Kinsei 43 air-cooled radial
Span	15·5 m (51 ft 2 in)
Length	10·234 m (33 ft 10 in)
Weight loaded	4,000 kg (8,818 lb)
Crew	Three
Maximum speed	205 knots at 2,200 m (7,200 ft)
Normal range	1,888 nautical miles
Bomb-load	One 800-kg torpedo or equivalent weight of bombs
Armament	One flexibly-mounted 7·7-mm. Type 92 machine-gun

The B5M1 was Mitsubishi's equivalent of the Nakajima B5N. It was used briefly from land bases at the beginning of the war of 1941–5, but its rival was so phenomenally successful that production was terminated after 125 aircraft had been delivered.

Mitsubishi C5M2

Official des.	Naval Type 98 Reconnaissance Aircraft Model 2

See Mitsubishi Ki–15–II and C5M2

Mitsubishi F1M2

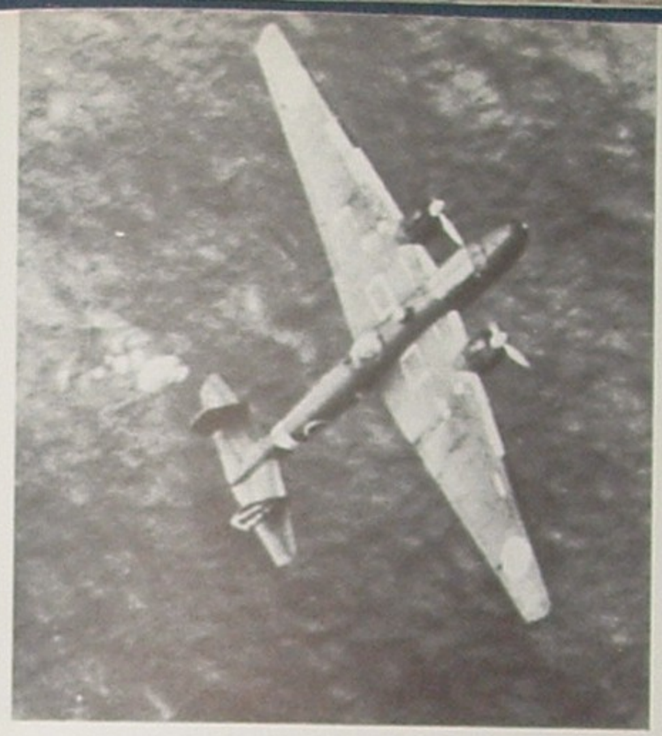
Official des.	Naval Type O Observation Seaplane Model 11
Allied code name	Pete
Manufacturers	Mitsubishi Jukogyo KK Dai-Nijuichi Kaigun Kokusho
Description	Two-seater short-range reconnaissance seaplane of biplane configuration with large central float
Engine	875-h.p. Mitsubishi Zuisei 13 air-cooled radial
Span	11 m (36 ft 1 in)
Length	9·5 m (31 ft 2 in)
Height	4 m (13 ft 1 in)
Wing area	29·5 sq m (318 sq ft)
Weight empty	1,928 kg (4,251 lb)
Weight loaded	2,550 kg (5,622 lb)
Crew	Two
Maximum speed	200 knots at 3,440 m (11,250 ft)
Range	400 nautical miles
Service ceiling	9,440 m (31,000 ft)
Bomb-load	Two 60-kg bombs could be carried
Armament	One rearward-firing Type 92 and two forward-firing Type 97 7·7-mm. machine-guns

The Mitsubishi F1M first flew in 1936. Four prototypes with the designation F1M1 were built and tested before a much-modified version went into production as the F1M2 or Naval Type O Observation Seaplane Model 11. Designed to be launched by catapult from cruisers and battleships and to act as spotter for ships' guns and to report the approach of hostile warships, it was used during the Second World War for many other purposes and had often to operate from improvised bases in natural or artificial harbours or lagoons. On the whole it acquitted itself well as a general reconnaissance aircraft and even as a fighter and dive-bomber. It was also pressed into service for convoy escort and off-shore patrols, and its success as a dive-bomber delivering two 60-kg bombs led to an experiment in which it was made to carry a 250-kg bomb. More than a thousand F1M2s were completed, about half of them by Mitsubishi and the other half by the 21st Naval Air Arsenal (Dai-Nijuichi Kaigun Kokusho). A few were modified as trainers with the the designation F1M2–K.

Mitsubishi G3M2 and G3M3

Official des.	G3M2: Naval Type 96 Attack-Bomber Model 21, 22 G3M3: Naval Type 96 Attack-Bomber Model 23
Allied code name	Nell
Manufacturers	Mitsubishi Jukogyo KK Nakajima Hikoki KK
Description	Twin-engine land-based long-range bomber and torpedo-bomber of mid-wing monoplane configuration
Engines	G3M2: Two 1,075-h.p. Mitsubishi Kinsei 41, 42 or 45 air-cooled radials G3M3: Two 1,300-h.p. Mitsubishi Kinsei 51 air-cooled radials
Span	25 m (82 ft)
Length	16·45 m (54 ft)
Height	3·685 m (12 ft 1 in)
Wing area	75 sq m (807 sq ft)
Weight empty	Model 22: 4,965 kg (10,936 lb) Model 23: 5,243 kg (11,551 lb)
Weight loaded	Models 22 and 23: 8,000 kg (17,637 lb)
Crew	Early models: Five Later models: Seven
Maximum speed	Early models: 202 knots at 4,000 m (13,000 ft) Later models: 225 knots at 6,000 m (20,000 ft)
Cruising speed	G3M2: 150 knots at 4,000 m (13,000 ft) G3M3: 160 knots at 4,000 m (13,000 ft)
Maximum range	G3M2: 2,635 nautical miles G3M3: 3,363 nautical miles
Service ceiling	G3M2: 9,100 m (30,000 ft) G3M3: 10,250 m (33,500 ft)
Bomb-load	One 800-kg torpedo or an equivalent weight of bombs
Armament	Model 21: Three 7·7-mm. Type 92 machine-guns in one ventral and two dorsal positions Models 22 and 23: One 20-mm. Type 99 Model 1 cannon in dorsal position, four 7·7-mm. Type 92 machine-guns in dorsal and beam positions

In 1933 a future Commander-in-Chief of the Combined Fleet, Admiral Isoruku Yamamoto, suggested that the naval authorities should develop a long-range land-based aircraft to supplement the efforts of their carrier-borne units. Their response was to invite Mitsubishi to submit proposals for a maritime reconnaissance aircraft from which a torpedo-bomber might be developed. A prototype designed by Sueo Honjo in association with Tomio Kubo and Nobuhiko Kusabake was tested in 1934. Impressed by its good all-round performance and phenomenal range, the authorities then asked for an attack-bomber capable of carrying an 800-kg payload. Twenty-one prototypes or pre-production models were tested before the aircraft went into production in 1936 as the G3M1 or Naval Type 96 Attack-Bomber Model 11. This version, powered by Mitsubishi Kinsei 3 engines, was followed after some thirty to forty aircraft had been built by the G3M2



46 (Far left) Mitsubishi G3M2 Naval Type 96 Attack-Bombers flying in formation. Torpedo-bombers of this mark, supplemented by G4M1 torpedo-bombers and guided by C5M2 reconnaissance aircraft, played a leading part in the sinking of the *Prince of Wales*, and the *Repulse* off the east coast of Malaya in 1941. The Allied code name was NELL
47 (Left) This photograph of a Mitsubishi G3M Naval Type 97 Attack-Bomber shows clearly the twin fins and rudders and the distinctive taper of the wings

Model 21, with Kinsei 41 or 42 engines. The Model 21 was in turn succeeded by the G3M2 Model 22, with Kinsei 45 engines and a better performance at heights above 15,000 feet or so. On the outbreak of war with the Western Powers, some 200 G3M2s were serving with first-line units. Sixty, accompanied by 26 G4M1s and starting from bases in southern Indo-China, were despatched on the mission that led to the sinking of the *Prince of Wales* and the *Repulse*. Meanwhile Mitsubishi had stopped making the G3M2 after turning out some 580 production aircraft. Production of the G3M3 was undertaken by Nakajima, who completed more than 400 G3M2s and G3M3s between 1941 and 1943.

Mitsubishi G4M

Official des.	G4M1: Naval Type 1 Attack-Bomber Model 11, 12 G4M2: Naval Type 1 Attack-Bomber Model 22, 22A, 22B G4M2a: Naval Type 1 Attack-Bomber Model 24, 24A, 24B, 24C, 24J G4M3: Naval Type 1 Attack-Bomber Model 34, 34A, 36
Allied code name	Betty
Manufacturer	Mitsubishi Jukogyo KK
Description	Twin-engine land-based long-range bomber and torpedo-bomber of mid-wing monoplane configuration
Engines	Model 11: Two 1,530-h.p. Mitsubishi Kasei 11 air-cooled radials Model 12: Two 1,530-h.p. Mitsubishi Kasei 15 air-cooled radials Models 22, 22A, 22B: Two 1,800-h.p. Mitsubishi Kasei 21 air-cooled radials Models 24, 24A, 24B, 24C, 24J, 34, 34A: Two 1,825-h.p. Mitsubishi Kasei 25b air-cooled radials Model 36: Two 1,825-h.p. Mitsubishi Kasei 25b Ru air-cooled radials
Span	25 m (82 ft)
Length	G4M1, M2: 20 m (65 ft 7 in) M3: 19·5 m (64 ft)
Height	6 m (19 ft 8 in)
Wing area	78·1 sq m (841 sq ft)
Weight empty	G4M1: 6,800 kg (14,991 lb) M2: 8,160 kg (17,990 lb) M3: 8,350 kg (18,409 lb)
Weight loaded	G4M1: 9,500 kg (20,944 lb) M2, M3: 12,500 kg (27,558 lb)
Crew	Seven
Maximum speed	G4M1: 231 knots at 4,200 m (14,000 ft) M2: 236 knots at 4,600 m (15,000 ft) M3: 254 knots at 5,150 m (17,000 ft)
Cruising speed	170 knots at 3,000 m (10,000 ft) (G4M1) or 4,000 m (13,000 ft) (M2, M3)
Maximum range	G4M1: 3,256 nautical miles M2: 3,270 nautical miles M3: 2,340 nautical miles
Service ceiling	G4M1: Not known M2: 8,950 m (29,350 ft) M3: 9,220 m (30,250 ft)
Bomb-load	G4M1: One 800-kg torpedo or equivalent weight of bombs M2, M3: One 800-kg torpedo or up to 1,000 kg of bombs
Armament	Model 11, Model 12: Four 7·7-mm. Type 92 machine-guns in forward, dorsal and beam positions; one 20-mm. Type 99 Model 1 cannon in tail turret Models 22, 24, 34 and projected Models 25 and 27: Four 7·7-mm.

48 Mitsubishi G4M2 Naval Type 1 Attack-Bomber Model 24. This captured specimen was one of a batch modified to carry the *Ohka* (Cherry Blossom) piloted missile and given the designation G4M2e. The Allies used the code name BETTY for all versions

Type 92 machine-guns in nose and beam positions, two 20-mm. Type 99 Model 1 cannon in dorsal and tail positions

Models 22A, 24A, 34A: Two 7·7-mm. Type 92 machine-guns in nose, four 20-mm. Type 99 Model 1 cannon in beam, dorsal and tail positions

Models 22B, 24B, 24J, 36 and projected Model 26: Two 7·7-mm. Type 92 machine-guns in nose, four 20-mm. Type 99 Model 2 cannon in beam, dorsal and tail positions

Model 24C: One 7·7-mm. Type 92 and one 13-mm. Type 2 machine-gun in nose; four 20-mm. Type 99 Model 2 cannon in dorsal, beam and tail positions

The G4M was intended as a follow-up to the G3M. The specification was issued in November 1937. Largely because Mitsubishi's staff were preoccupied with the A6M, the prototype was not ready until two years later. In the interests of speed and range, and to ease production problems, protective armour for crew and fuel tanks was omitted. The prototype behaved well when it was tested in October 1939, but thereafter progress was delayed while an attempt was made to develop a heavy-fighter version for long-range escort. Production was authorized in 1940 and the first aircraft of the production series was delivered in the spring of 1941. On the outbreak of war with the Western Powers, about 110 G4M1s were serving with the Eleventh Air Fleet in Indo-China and Formosa. Exploits to which they contributed in the first week of hostilities included the sinking of the *Prince of Wales* and the *Repulse* and some devastating attacks on objectives in the Philippines. Based later at Kendari in Celebes, G4M1s of the Eleventh Air Fleet attacked Darwin on 19 February 1942, some two hours after carrier-borne aircraft of Admiral Nagumo's Striking Force had dropped bombs there. But these attacks were made in face of little more than token opposition. Once the Allies were in a position to hit back, the G4M1 became notorious for the ease with which it could be shot down in flames.

In the Model 12 version of the G4M1 an attempt was made at fireproofing the fuel tanks, but this change did not save units equipped with the new version from heavy losses. The shortcomings of the G4M1 became all too obvious when, on 18 April 1943, Allied fighters destroyed two aircraft bound for Bougainville and carrying Admiral Yamamoto and members of his staff.

The G4M2, introduced a few months later, proved equally vulnerable. A redesigned G4M with self-sealing tanks and protective armour for both tanks and crew went into production in the autumn of 1944 as the G4M3 or Model 34; but only some sixty aircraft of this version were completed, as compared with more than 2,300 G4M1s and G4M2s.

The following versions of the G4M were put into production or projected:

Heavy fighter version: See Mitsubishi G6M1.

Model 11: G4M1 with Kasei 11 engines.

Model 12: G4M1 with Kasei 15 engines. Fuel tanks partially protected by layers of sheet-rubber and sponge-like material.

Model 22: G4M2. Kasei 21 engines. Improved performance and heavier armament.

Model 22A: Version of G4M2 with four 20-mm. cannon.

Model 22B: Version of G4M2 with Type 99 Model 2 cannon.

Model 24: G4M2a. Kasei 25 engines. Armament as Model 22. Fourteen aircraft only.

Model 24A: Similar to Model 24, but armament as Model 22A.

Model 24B: Similar to Model 24, but armament as Model 22B. Late production aircraft carried air-to-surface radar.

Model 24C: Similar to Model 24B, but one of two machine-guns in forward position was 13-mm. Type 2. Late production models carried air-to-surface radar.

Model 24J: Production aircraft of Model 24B or 24C series modified to carry *Ohka* piloted missile and redesignated G4M2e. Poor handling qualities and easily shot down.

Model 25: Second prototype of G4M2a with Kasei 25 replaced by Kasei 27 engines. One experimental aircraft only.

Model 26: G4M2 or G4M2a airframe with Kasei 25b Ru turbosupercharged engines. Designated G4M2c. Two experimental aircraft only.

Unnamed model: Prototype G4M2 with Kasei 21 engines replaced by Kasei 25b (not turbosupercharged). One aircraft only.

Model 34: G4M3. Kasei 25 engines. Self-sealing tanks. Tanks and crew protected by armour.

Model 34A: Proposed version of Model 34 with modified armament, intended for anti-submarine patrols and as transport aircraft. Not put into production.

Model 36: G4M3 airframe with Kasei 25b Ru turbosupercharged engines. Still in experimental stage at end of war.

Mitsubishi G6M1, G6M1–K, G6M–L2

Official des.	G6M1: Naval Type 1 Wing-tip Convoy Fighter G6M1–K: Naval Type 1 Large Land Trainer G6M–L2: Naval Type 1 Transport Aircraft
Allied code name	(Betty)
Manufacturer	Mitsubishi Jukogyo KK
Description	Version of G4M1 bomber intended as long-range escort fighter and used after modification as trainer and as transport aircraft

Two prototypes of the G4M1 attack bomber were built in 1939 and 1940 to a specification which called for a maximum speed of 215 knots and a range without bomb-load of 2,600 nautical miles. The second prototype exceeded these requirements by attaining a speed of 240 knots and covering 3,000 nautical miles. Since the navy had no escort fighter capable of accompanying such a bomber to its objectives, production was held up while an attempt was made to develop one from the G4M1 itself. Thirty G6M1 heavy fighters, each armed with four 20-mm. cannon and one machine-gun, were completed, but they proved too slow for their intended task. The G6M1 was therefore modified for employment as a trainer, and later a version with further modifications was used to lift paratroops. In appearance the G6M1 resembled the G4M1, but the bomb-bay was faired over and a gondola housing two 20-mm. cannon was slung under the fuselage. The Allies applied the same code name to all versions of the G4M and G6M.

49 & 50 Captured examples of the Mitsubishi J2M3 Naval Interceptor Fighter *Raiden* (Thunderbolt) on the ground and flying in formation. Known to the Allies as JACK, the J2M3 was capable of speeds in excess of 360 miles an hour and could climb to 6,000 metres in just over six minutes. See also Colour Section (III)

Mitsubishi J2M Thunderbolt

Official des.	Naval Interceptor Fighter Thunderbolt Model 11, 21, 21A, 33, 31
Allied code name	Jack
Manufacturers	Mitsubishi Jukogyo KK Koza Kaigun Kokusho
Description	Single-seater land-based interceptor fighter of low-wing monoplane configuration
Engine	1,800-h.p. Mitsubishi Kasei 23a or 1,820-h.p. Mitsubishi Kasei 23c or 26a air-cooled radial
Span	10·8 m (35 ft 5 in)
Length	J2M2: 9·695 m (31 ft 10 in) J2M3, 5, 6: 9·945 m (32 ft 8 in)
Height	J2M2: 3·875 m (12 ft 9 in) J2M3, 5, 6: 3·945 m (12 ft 11 in)
Wing area	20 sq m (216 sq ft)
Weight empty	J2M2: 2,348 kg (5,176 lb) J2M3: 2,460 kg (5,423 lb) J2M5: 2,510 kg (5,534 lb)
Weight loaded	J2M2: 3,210 kg (7,077 lb) J2M3: 3,435 kg (7,573 lb) J2M5: 3,482 kg (7,676 lb)
Crew	One
Maximum speed	J2M2: 322 knots at 5,500 m (18,000 ft) J2M3: 317 knots at 5,300 m (17,400 ft) J2M5: 332 knots at 6,800 m (22,000 ft)
Range	An endurance of not less than forty-five minutes at full rated power was specified
Service ceiling	J2M2: Not known J2M3: 11,700 m (38,000 ft) J2M5: 11,250 m (37,000 ft)
Bomb-load	Two 60-kg bombs could be carried in place of drop-tanks
Armament	J2M2: Two fuselage-mounted 7·7-mm. Type 97 machine-guns and two wing-mounted 20-mm. Type 99 Model 1 cannon J2M3, 5, 6: Two Type 99 Model 1 and two Type 99 Model 2 20-mm. cannon, all wing-mounted J2M3a (Model 21A): Four 20-mm. Type 99 Model 2 cannon, all wing-mounted

As the outcome of discussions between Mitsubishi and the naval authorities which began as early as 1938, a prototype J2M1 was completed in February 1942. Many changes were needed before the aircraft went into production as the J2M2 or Naval Interceptor Fighter Thunderbolt Model 11. The J2M2 could reach 20,000 feet in less than six minutes from take-off, but it was dogged by technical troubles and pilots complained of poor visibility from the cockpit. Similar complaints were made against the more heavily armed J2M3 and J2M3a (Models 21 and 21A). Moreover, the J2M3 was some six miles an hour slower than its forerunner, and its rate of climb left something to be desired. It was therefore manufactured only in limited numbers until raids on the Japanese homeland by B–29s brought an urgent demand for high-altitude interceptors. In the meantime a version powered by a turbosupercharged Kasei 23c engine, to be called the J2M4 or Model 34, was projected but did not go into production. In place of it Mitsubishi introduced the J2M5, or Model 33, with a Kasei 26a engine boosted by a mechanically-driven three-stage supercharger. A cross between the J2M3 and the J2M5, to be called the J2M6 or Model 31, was planned, but only one aircraft of this series was completed. About 470 J2M2s, J2M3s, and J2M5s were built by Mitsubishi and an unknown number of J2M5s by the Koza Naval Air Arsenal (Koza Kaigun Kokusho).

Mitsubishi J8M (Ki–200) Swinging Sword

Official des.	Naval Experimental 19-Shi Rocket-Powered Interceptor Fighter Army Experimental Rocket-Powered Interceptor Fighter Swinging Sword
Allied code name	None
Manufacturer	Seven prototype aircraft built by Mitsubishi Jukogyo KK
Description	Single-seater rocket-propelled interceptor fighter based on Messerschmitt Me 163B
Engine	Rocket motor based on Walter HWK 109–509
Span	9·5 m (31 ft 2 in)
Length	6·05 m (19 ft 10 in)
Height	2·7 m (8 ft 10 in)
Wing area	17·7 sq m (191 sq ft)
Weight empty	1,505 kg (3,318 lb)
Weight loaded	3,885 kg (8,565 lb)

Crew	One
Maximum speed	900 km/h at 10,000 m (560 m.p.h. at 33,000 ft)
Range	The J8M1 could remain under power for 5½ minutes
Service ceiling	12,000 m (39,500 ft)
Bomb-load	None
Armament	One or two wing-mounted 30-mm. Type 5 cannon

In 1944 the Japanese government acquired manufacturing rights in the Messerschmitt Me 163B short-range interceptor fighter and the Walter HWK 109–509 rocket motor which propelled it. A set of technical drawings was lost on passage from Germany, but a rocket motor and an instruction manual for the Me 163B arrived safely. On the strength of these the development of a rocket-propelled interceptor fighter as a joint-service venture was entrusted to Mitsubishi. A mock-up was completed in September and seven prototype aircraft were built. The first crashed on its first powered flight in July 1945, but the aircraft proved capable of climbing to 10,000 metres in three and a half minutes and was very fast. A production programme was begun before the end of the war, but no aircraft of the production series were completed. Two versions, the J8M1 with two 30-mm. cannon and the J8M2 with one cannon replaced by additional fuel tanks, were to have been manufactured.

Mitsubishi K3M2 and K3M3

Official des.	Naval Type 90 Crew Trainer Model 1, Model 2
Allied code name	Pine
Manufacturers	Mitsubishi Jukogyo KK Aichi Tokei Denki KK KK Watanabe Tekkosho
Description	Five-seater or six-seater parasol-wing monoplane used as trainer and sometimes as communications and light transport aircraft
Engine	340-h.p. Hitachi Amakaze 11 or 580-h.p. Nakajima Kotobuki 2 KAI air-cooled radial
Span	15·78 m (51 ft 9 in)
Length	9·54 m (31 ft 4 in)
Height	3·82 m (12 ft 6 in)
Wing area	34·5 sq m (371 sq ft)

51 Known to the Japanese naval authorities as the C5M and in civilian guise as the *Karigane* or Wild Goose, the Mitsubishi Ki-15 Army Type 97 Command Reconnaissance Aircraft first flew in prototype form in 1936 and remained in first-line service until the early part of 1942. The aircraft shown has civilian markings. The Allies used the code name BABS for all versions

The Mitsubishi K3M2 was designed some twelve years before Japan went to war with the Western Powers, and the prototype (powered by a licence-built Hispano-Suiza engine) first flew in 1930. The K3M3 was introduced in 1939. Although production ceased in 1941, both aircraft were used as trainers during the war, and a few were employed in modified form as communications and transport aircraft.

Mitsubishi (Dai-Ichi Kaigun Kokusho) L3Y1, L3Y2

Official des.	Naval Type 96 Transport Aircraft Model 11, Model 12
Allied code name	Tina
Manufacturers	Mitsubishi Jukogyo KK Dai-Ichi Kaigun Kokusho (modification of aircraft built by Mitsubishi)
Description	Transport versions of G3M1 and G3M2
Technical data	L3Y1: As for G3M2, except that engines were Mitsubishi Kinsei 3 air-cooled radials; unladen and laden weights were approximately 4,770 kg (10,516 lb) and 7,642 kg (16,848 lb) respectively; maximum speed was of the order of 180 to 190 knots; service ceiling about 7,500 m (24,500 ft); armament one 7·7-mm. Type 92 machine-gun L3Y2: As for G3M2 with Kinsei 45 engines, except that armament was reduced to one 7·7-mm. Type 92 machine-gun

Before the war of 1941–5 a number of Mitsubishi G3M1s were used by the armed forces as transport aircraft. In addition, twenty or more G3M2s were adapted for civil purposes and used for demonstration flights or by Nippon Koku or Dai Nippon Koku on scheduled routes. Some of these remained in use during the war. They were supplemented by a number of G3M1s and G3M2s modified by the 1st Naval Air Arsenal (Dai-Ichi Kaigun Kokusho). Aircraft similarly modified, and known respectively as the L3Y1 or Naval Type 96 Transport Aircraft Model 11 and the L3Y2 or Naval Type 96 Transport Aircraft Model 12, were delivered to naval air transport units. These were given by the Allies the code name Tina. The Y in the short designation

stood for Yokosuka, although the modification was made not by the 1st Naval Air Technical Arsenal at Yokosuka but by the 1st Naval Air Arsenal at Kasumigaura.

Mitsubishi Ki–15–II and C5M2

Official des.	Ki–15–II: Army Type 97 Command Reconnaissance Aircraft Model 2 C5M2: Naval Type 98 Reconnaissance Aircraft Model 2
Allied code name	Babs
Manufacturer	Mitsubishi Jukogyo KK
Description	Two-seater low-wing monoplane used by both army and navy for strategic reconnaissance
Engine	Ki–15–II: 900-h.p. Army Type 99 Model 1 (Mitsubishi Ha–26–I) air-cooled radial C5M2: 950-h.p. Nakajima Sakae 12 air-cooled radial
Span	12 m (39 ft 4 in)
Length	8·7 m (28 ft 7 in)
Height	Ki–15–II: 3·34 m (11 ft) C5M2: 3·465 m (11 ft 4 in)
Wing area	20·4 sq m (219 sq ft)
Weight empty	Ki–15–II: 1,592 kg (3,510 lb) C5M2: 1,715 kg (3,781 lb)
Weight loaded	Ki–15–II: 2,189 kg (4,826 lb) C5M2: 2,345 kg (5,170 lb)
Crew	Two
Maximum speed	Ki–15–II: 510 km/h at 4,330 m (317 m.p.h. at 14,000 ft) C5M2: 263 knots at 4,550 m (15,000 ft)
Cruising speed	Not known. The Ki–15–I is credited with a cruising speed of 320 km/h (about 200 m.p.h.) at an unspecified height
Range	Not known. A leading authority gives the range of the C5M2 as 600 nautical miles, but neither this figure nor the figure of 590 miles with a 330-lb bomb load given in the British official history would seem to be correct. There is evidence that the C5M2 could operate at or about 400 miles from its base, so its range can scarcely have been less than 800 miles. The Ki–15–I is said to have had a range of 2,400 kilometres, or roughly 1,500 miles
Service ceiling	Not known, but probably about 11,000 metres or 37,000 feet
Bomb-load	None
Armament	One flexibly mounted 7·7-mm. Type 89 or Type 92 machine-gun firing to the rear

The precursor of the Ki–15–II and the C5M2 was the Ki–15–I or Army Type 97 Command Reconnaissance Aircraft Model 1, which was also manufactured for non-military use as the Wild Goose I Communications Aircraft. The Ki–15–II was introduced in prototype form in 1938 and put into production in 1939. The C5M2 was substantially the same aircraft as the Ki–15–II, except that it was powered by a different engine and carried a quantity of naval equipment which added considerably to its weight. Production ceased in 1940, but both versions were still in first-line service on the outbreak of war with the Western Powers in 1941. It was the crew of a C5M2 of the 22nd Air Flotilla based in southern Indo-China, who spotted the *Prince of Wales* and the *Repulse* off the east coast of Malaya on 10 December, 1941, and directed the flotilla's bombers and torpedo-bombers towards their objective.

Mitsubishi Ki–21–I, Ki–21–II

Official des.	Army Type 97 Heavy Bomber Model 1A, 1B, 1C, 2A, 2B
Allied code name	Sally (also called Jane, Gwen)
Manufacturers	Mitsubishi Jukogyo KK Nakajima Hikoki KK
Description	Twin-engine mid-wing monoplane used as heavy bomber and sometimes as transport or communications aircraft
Engines	Ki–21–I: Two 850-h.p. Army Type 97 (Nakajima Ha–5 KAI) air-cooled radials Ki–21–II: Two 1,450-h.p. Army Type 100 (Mitsubishi Ha–101) air-cooled radials
Span	22·5 m (73 ft 10 in)
Length	16 m (52 ft 6 in)
Height	I: 4·35 m (14 ft 3 in) II: 4·85 m (15 ft 11 in)
Wing area	69·6 sq m (749 sq ft)
Weight empty	I: 4,691 kg (10,342 lb) II: 6,070 kg (13,382 lb)
Weight loaded	I: 7,492 kg (16,517 lb) II: 9,710 kg (21,407 lb)
Crew	Normally five, but two additional gunners could be carried. Transport or communications version, crew of four with cargo or up to nine passengers
Maximum speed	I: 432 km/h at 4,000 m (268 m.p.h. at 13,000 ft) II: 468 km/h at 4,720 m (302 m.p.h. at 15,500 ft)
Cruising speed	I: Not known II: 380 km/h at 5,000 m (236 m.p.h. at 16,500 ft)
Range	I: 1,500 to 2,700 m (930 to 1,680 miles), according to load II: Up to 2,700 km (1,680 miles)
Service ceiling	I: 8,600 m (28,200 ft) II: 10,000 m (33,000 ft)
Bomb-load	Normal, 750 kg; maximum, 1,000 kg
Armament	Model 1A: Three 7·7-mm. Type 89 machine-guns in forward, dorsal and ventral positions Model 1B: Four 7·7-mm. Type 89 machine-guns in forward, dorsal, ventral and tail positions and one firing to port and starboard through openings in sides of fuselage Models 1C and 2A: Six 7·7-mm. Type 89 machine-guns in forward, dorsal, ventral, tail and beam positions Model 2B: Five 7·7-mm. Type 89 machine-guns in forward, ventral, tail and beam positions and one 12·7-mm. Type 1 machine-gun in a dorsal turret

The Ki–21 first flew in prototype form in December 1936. Many modifications were made before it went into production. Contracts were then placed with Mitsubishi and Nakajima, who between them completed well over 750 aircraft of the Ia, Ib, and Ic series before production of the Ki–21–I was suspended in the early part of 1941. The Ki–21–II, first tested in the spring of 1940, was manufactured solely by Mitsubishi. More than 1,200 aircraft of the IIa and IIb series were completed, the last in the autumn of 1944. When Japan entered the Second World War only a few Ki–21–Is were still in first-line service, most heavy bomber units having rearmed by that time with the Ki–21–II. Much liked by Japanese airmen because it was pleasant to handle and easily maintained, the Ki–21 did good service in the early months of the war, but became a notoriously easy prey for hostile fighters once the Allies took its measure. Repeated attempts by the authorities to improve its armament did not save units equipped with it from heavy losses, but so much difficulty was experienced in finding a fully acceptable successor that it remained the army's standard heavy bomber long after its shortcomings had become apparent. A modified version, the MC–21, was used to a limited extent by Dai Nippon Koku

52 (Far left) Mitsubishi Ki-21 Army Type 97 Heavy Bomber. In production from 1936 to 1944 and known to the Allies as SALLY, the Ki-21 was used both as a bomber and as a transport aircraft with the designation MC-21
53 (Left) Mitsubishi Ki-30 Army Type 97 Light Bomber. Introduced to active service in China in 1938, the Ki-30 was the first Japanese light bomber to possess such up-to-date features as an internal bomb-bay and a variable-pitch airscrew. The Allied code name was ANN

KK to carry passengers and supplies on behalf of the military authorities to destinations in Manchuria and occupied China, and towards the end of the war a number of surviving bombers were modified and used as transport or communications aircraft by units in the field.

Mitsubishi Ki–30

Official des.	Army Type 97 Light Bomber
Allied code name	Ann
Manufacturers	Mitsubishi Jukogyo KK Tachikawa Dai-Ichi Rikugun Kokusho
Description	Two-seater single-engine light bomber of mid-wing monoplane configuration with fixed spatted undercarriage
Engine	850-h.p. Army Type 97 (Nakajima Ha–5 KAI) air-cooled radial
Span	14·55 m (47 ft 9 in)
Length	10·34 m (33 ft 11 in)
Height	3·645 m (12 ft)
Wing area	30·6 sq m (329 sq ft)
Weight empty	2,230 kg (4,916 lb)
Weight loaded	3,322 kg (7,324 lb)
Crew	Two
Maximum speed	432 km/h at 4,000 m (263 m.p.h. at 13,000 ft)
Cruising speed	380 km/h (236 m.p.h.)
Range	1,700 km (1,060 miles)
Service ceiling	8,500 m (28,000 ft)
Bomb-load	Normal, 300 kg; maximum, 400 kg
Armament	One wing-mounted and one rearward-firing 7·7-mm. Type 89 machine-gun

The Ki–30 first flew in prototype form in February 1937. Production began in the spring of the following year. About 600 aircraft of the production series were completed by Mitsubishi between 1938 and 1940, some 70 by the First Army Air Arsenal (Tachikawa Dai-Ichi Rikugun Kokusho) between 1939 and 1941. Ki–30s were used by the 5th Air Division to support the Fourteenth Army's occupation of the Philippines towards the end of 1941 and early in 1942, but soon afterwards surviving aircraft of the type were relegated to training units or otherwise disposed of.

Mitsubishi Ki–46

Official des.	Ki–46–I, II, III: Army Type 100 Command Reconnaissance Aircraft Model 1, 2, 3 Ki–46–II KAI: Army Type 100 Operational Training Aircraft Ki–46–III KAI: Army Type 100 Air Defence Fighter
Allied code name	Dinah
Manufacturer	Mitsubishi Jukogyo KK
Description	Twin-engine high-performance aircraft designed for strategic reconnaissance and in modified versions used also as trainer and as high-altitude fighter
Engines	I: Two 900-h.p. Army Type 99 Model 1 (Mitsubishi Ha–26–I) air-cooled radials II: Two 1,050-h.p. Army Type 1 (Mitsubishi Ha–102) air-cooled radials III: Two 1,500-h.p. Army Type 4 (Mitsubishi Ha–112–II) air-cooled radials
Span	14·7 m (48 ft 3 in)
Length	11 m (36 ft 1 in)
Height	3·88 m (12 ft 9 in)
Wing area	32 sq m (344 sq ft)
Weight empty	I: 3,379 kg (7,449 lb) II: 3,263 kg (7,194 lb) III: 3,831 kg (8,446 lb)
Weight loaded	I: 4,822 kg (10,631 lb) II: 5,050 kg (11,133 lb) III: 5,722 kg (12,619 lb)
Crew	Normally two, but Ki–46–II KAI was three-seater
Maximum speed	I: 540 km/h at 4,000 m (336 m.p.h. at 13,000 ft) II: 604 km/h at 5,800 m (375 m.p.h. at 19,000 ft) III: 630 km/h at 6,000 m (391 m.p.h. at 20,000 ft)
Cruising speed	Not known for all versions, but that of Ki–46–II was 400 km/h at 4,000 m (250 m.p.h. at 13,000 ft)

54 Mitsubishi Ki-46 Army Type 100 Command Reconnaissance Aircraft. A fast, handsome spyplane much admired by the Allies, who called it DINAH

Range	I: 2,100 km (1,300 miles) II: 2,474 km (1,540 miles) III: 4,000 km (2,500 miles)
Service ceiling	All versions about 10,500 m (34,500 ft)
Bomb-load	None
Armament	I and II: One flexibly mounted 7·7-mm. Type 89 machine-gun firing to the rear III: Two 20-mm. Ho-5 cannon in the nose and (III KAI only) one 37-mm. Ho-203 cannon firing forwards at an angle to the line of flight.

The Ki-46 was designed by Tomio Kubo of Mitsubishi, with assistance from the Aeronautical Research Institute of the University of Tokyo, to meet a specification which called for a 600-kilometre-an-hour successor to the Ki-15. The prototype first flew in November 1939. It failed to attain the stipulated speed but was appreciably faster than any contemporary Japanese fighter. Moreover, while trials were still in progress Mitsubishi predicted that a forthcoming version to be powered by their Ha-102 engine with two-stage supercharger would reach 600 kilometres an hour without difficulty. The outcome was that only some thirty to forty production aircraft of the Ki-46-I series were completed and that production did not really get into its stride until the Ha-102-powered Ki-46-II was ready. When the prototype was tested in the spring of 1941, it justified Mitsubishi's confidence by covering a measured distance in both directions at an average speed of 604 kilometres an hour and giving a satisfactory all-round performance at heights up to 35,000 feet. The Ki-46-II remained in production until 1944, and some of the thousand or more aircraft produced were still in first-line service at the end of the war. Meanwhile the Ki-46-III, powered by the Ha-112-II, was introduced. About 600 aircraft of this series were completed between 1942 and 1945. Like the Ki-46-II, the Ki-46-III was used chiefly for strategic reconnaissance, but a modified version, the Ki-46-III KAI, was pressed into service as a high-altitude fighter, although a rather modest rate of climb made it an indifferent performer in that role. In addition, an attempt was made to equip the Ki-46-III for a battlefield role as Army Type 100 Assault Aircraft Ki-46-IIIb, but only a few aircraft of this sub-type were completed. Two variants of a 630-kilometre-an-hour version, powered by Ha-112-II Ru engines with turbosuperchargers and designated the Ki-46-IVa and Ki-46-IVb, were projected, but neither went into production although four prototypes were built and tested with satisfactory results.

55 Mitsubishi Ki-51 Army Type 99 Assault Aircraft. Developed from the Ki-30 and designed by the same team, the Ki-50 was in production from the beginning of 1940 until the summer of 1945. The Allied code name was SONIA

Mitsubishi Ki-51

Official des.	Army Type 99 Assault Aircraft
Allied code name	Sonia
Manufacturers	Mitsubishi Jukogyo KK Tachikawa Dai-Ichi Rikugun Kokusho
Description	Two-seater single-engine low-wing monoplane used as ground-attack and tactical reconnaissance aircraft
Engine	900-h.p. Army Type 99 Model 2 (Mitsubishi Ha-26-II) air-cooled radial
Span	12·1 m (39 ft 8 in)
Length	9·21 m (30 ft 3 in)
Height	2·73 m (9 ft)
Wing area	24 sq m (259 sq ft)
Weight empty	1,872 kg (4,129 lb)
Weight loaded	2,798 kg (6,169 lb)
Crew	Two
Maximum speed	424 km/h at 3,000 m (263 m.p.h. at 10,000 ft)
Range	1,000 km (660 miles)
Service ceiling	8,270 m (27,000 ft)
Bomb-load	Four 50-kg or twelve 15-kg bombs
Armament	One 7·7-mm. rearward-firing Type 89 and two wing-mounted 7·7-mm. Type 89 or 12·7-mm. Type 1 machine-guns

The Mitsubishi Ki-51 was derived from the Ki-30 light bomber and designed by the same team. The specification called for a small, handy version of the Ki-30 suitable for giving close support to troops and able to operate from forward landing-grounds too primitive for high-performance aircraft. Engine and cockpit were protected by armour against fire from the ground. At one time separate ground-attack and tactical reconnaissance versions were contemplated. However, after testing prototypes of both versions the military authorities told Mitsubishi to complete the aircraft in ground-attack form but make provision for cameras to be installed in the field, so that units would be able to use any Ki-51 of the production series in either role. Notwithstanding its modest performance, the aircraft proved so successful that it remained in production from the beginning of 1940 until barely a month before the Japanese surrender. Mitsubishi completed some 1,500 aircraft of the production series; the First Army Air Arsenal (Tachikawa Dai-Ichi Rikugun Kokusho) about 900. An advanced version designed by Mansyu Hikoki Seizo KK and designated the Mansyu Ki-71 was tested in prototype form but not accepted for production.

Mitsubishi Ki-57 (MC-20)

Official des.	
Military	Army Type 100 Transport Aircraft Model 1 (Ki-57-I), Model 2 (Ki-57-II)
Naval	Naval Type O Transport Aircraft Model 11 (alternative designation, L4M1)
Civil	MC-20-I, MC-20-II
Allied code name	Topsy
Manufacturer	Mitsubishi Jukogyo KK
Description	Twin-engine monoplane used as troop-carrier, freighter and passenger aircraft
Engines	Ki-57-I, L4M1, MC-20-I: Two 850-h.p. Army Type 97 (Nakajima Ha-5 KAI) air-cooled radials Ki-57-II, MC-20-II: Two 1,050-h.p. Army Type 100 (Mitsubishi Ha-102) air-cooled radials

56 (Left) Mitsubishi Ki-57 Army Type 100 Transport Aircraft. Known to the Japanese naval authorities as the L4M and in civilian guise as the MC-20, the Ki-57 was used throughout the war of 1941 to 1945 as a troop transport, freighter and passenger aircraft. The Allies called it TOPSY. The photograph shows a surrendered aircraft with its crew under escort

Span	22·6 m (74 ft 2 in)
Length	16·1 m (52 ft 10 in)
Height	Earlier models: 4·77 m (15 ft 8 in)
	Later models: 4·86 m (15 ft 11 in)
Wing area	70·1 sq m (754 sq ft)

The genesis of the Ki–57 was a tentative design prepared by Mitsubishi in 1939 in response to a suggestion from the Japanese airline, Nippon Koku KK, that a passenger aircraft which would meet their needs might be developed from the Ki–21 heavy bomber. Mitsubishi's proposals were studied with interest by the military authorities, who needed a transport aircraft to carry paratroops. When Nippon Koku KK was reorganized later in the year as the government-sponsored Dai Nippon Koku KK, they issued a specification to cover both Dai Nippon's requirements and their own. A prototype was completed in the summer of 1940 and roughly a hundred Ki–57–Is or MC–20–Is were delivered in the course of the next two years. Most of them were used by the army or Dai Nippon, but a few were handed over to the navy. Ki–57–Is from bases in Malaya, escorted by fighters and accompanied by bombers, carried paratroops who landed near Palembang, in Sumatra, on 14 and 15 February 1942. With a maximum speed of 430 kilometres an hour and no defensive armament, they might have been expected to succumb to British Hurricanes from neighbouring bases; but on both occasions the Hurricanes were busy elsewhere, and they escaped interception.

The Ki–57–II or MC–20–II, some forty kilometres an hour faster, was introduced in 1942. About 400 of these aircraft were delivered to the army or Dai Nippon Koku between the latter part of that year and January 1945. Both the Ki–57–I and the Ki–57–II carried a crew of four and up to eleven passengers or paratroops. The range of both aircraft was of the order of 1,500 to 3,000 kilometres, according to load.

Mitsubishi Ki–67 Flying Dragon

Official des.	Army Type 4 Heavy Bomber Model 1 Flying Dragon
Allied code name	Peggy
Manufacturers	Mitsubishi Jukogyo KK Kawasaki Kokuki Kogyo KK Tachikawa Dai-Ichi Rikugun Kokusho (one aircraft only) Nippon Kokusai Koku Kogyo KK (no aircraft built *ab initio* but twenty-nine assembled)
Description	Twin-engine mid-wing monoplane intended as medium-range tactical support bomber and used also as torpedo-bomber
Engines	Two 1,900 -h.p. Army Type 4 (Mitsubishi Ha–104) air-cooled radials
Span	22·5 m (73 ft 10 in)
Length	18·7 m (61 ft 4 in)
Height	7·7 m (25 ft 3 in)
Wing area	65·9 sq m (709 sq ft)
Weight empty	8,649 kg (19,068 lb)
Weight loaded	13,765 kg (30,347 lb)
Crew	Six to eight
Maximum speed	537 km/h at 6,090 m (334 m.p.h. at 20,000 ft)
Cruising speed	400 km/h at 8,000 m (250 m.p.h. at 26,000 ft)
Range	2,800 km (1,740 miles) to 3,800 km (2,360 miles), according to load
Service ceiling	9,470 m (31,000 ft)
Bomb-load	500 to 800 kg of bombs or one 800-kg or 1,070-kg torpedo
Armament	Earlier models: Two 12·7-mm. Type 1 machine-guns in nose and tail positions, one 20-mm. Ho–5 cannon in dorsal turret, two 7·92-mm. Type 98 or 12·7-mm. Type 1 machine-guns in beam positions to port and starboard Later models: Two 12·7-mm. Type 1 machine-guns in tail position, one each in nose and port and starboard positions, one 20-mm. Ho–5 cannon in dorsal turret

The Mitsubishi Ki–67 *Hiryu*, or Flying Dragon, was designed to meet a specification drafted while Japan still hoped to avoid war with the Western Powers

but feared a confrontation between the Kwantung Army in Manchukuo and Soviet forces based in Outer Mongolia or Siberia. Three prototypes ordered early in 1941 were, however, not ready until late in 1942 and early in 1943. On test, the aircraft proved so exceptionally manoeuvrable for one of its size and weight that the military authorities had some difficulty in choosing between a number of applications proposed for it. Eventually they decided that only a single version, the Ki–67–I or Army Type 4 Heavy Bomber Model 1, should be put into series production but that all aircraft with serial numbers higher than 160 should be fitted with torpedo-racks so that they could be used either to support troops or for shipping strikes. The navy was allowed to acquire some of these, but the army air force as well as naval units used Ki–67s against Allied warships, notably off Formosa in 1944 and at Okinawa in 1945. Self-sealing fuel tanks, armour and a combination of hitting-power with a powerful defensive armament made the Flying Dragon a formidable weapon; but casualties suffered before it was ready to go into action forced the authorities to entrust a great many of the 700 aircraft produced to inexperienced crews who had to battle against heavy odds.

Mitsubishi Ki–71

Official des.	Ki–71 Army Experimental Tactical Reconnaissance Aircraft
Allied code name	Edna
Manufacturer	Three prototype aircraft built by Tachikawa Dai-Ichi Rikugun Kokusho
Description	Advanced tactical reconnaissance version of K–51 not put into production
Technical data	See K–51

A high-performance tactical reconnaissance version of the K–51 was proposed in 1941. As the outcome of a collaboration between engineers from Mansyu Hikoki Seizo and the staff of Dai-Ichi Rikugun Kokusho, three prototypes powered by Mitsubishi Ha–112–II radials were built. They received the designation Ki–71. Their performance was disappointing. The Ki–71 did not go into production, but the Allies learned that an advanced version of the Ki–51 was under development. They gave it the code name Edna.

57 (Above) Mitsubishi Ki-67 Army Type 4 Heavy Bomber. Known to the Allies as PEGGY and to the Japanese as the *Hiryu*, or Flying Dragon, the Ki-67 was in service from October 1944 until the end of the war

Mitsubishi Ki–109

Official des.	Ki–109 Army Experimental Interceptor Fighter
Allied code name	(Peggy)
Manufacturer	Mitsubishi Jukogyo KK
Description	Heavy fighter version of Ki–67 heavy bomber
Technical data	As for Ki–67 except that one 75-mm. Type 88 cannon was fitted in the nose; bomb bay, dorsal turret, and beam positions for guns were omitted; defensive armament was limited to one 12·7-mm. Type machine-gun in the tail; crew was reduced to four

Officers of the Army Aeronautical Research Institute suggested in 1943 that a heavy fighter, capable of dealing with American long-range bombers, might be developed from the Mitsubishi Ki–67 heavy bomber. A modified Ki–67 with a 75-millimetre cannon in the nose was tested in the following year and received the designation Ki–109. The military authorities then ordered forty-four aircraft, of which the first half were to be powered by Mitsubishi Ha–104 radials and the second half by Ha–104 Ru radials with exhaust-driven turbosuperchargers. As things turned out, only the first twenty-two aircraft were completed by the end of the war. Without turbosuperchargers, the Ki–109 attained a speed of 550 kilometres an hour (about 324 miles an hour) at 6,000 metres or roughly 20,000 feet.

Nakajima Aircraft

Nakajima A6M2–N

Official des.	Naval Type 2 Floatplane Fighter Model 11
Allied code name	Rufe
Manufacturer	Nakajima Hikoki KK
Description	Seaplane version of Mitsubishi A6M2 Zero Fighter
Engine	950-h.p. Nakajima Sakae 12 air-cooled radial
Span	12 m (39 ft 4 in)
Length	10·1 m (33 ft 2 in)
Height	4·3 m (14 ft 1 in)
Wing area	22·4 sq m (242 sq ft)
Weight empty	1,912 kg (4,235 lb)
Weight loaded	2,460 kg (5,423 lb)
Crew	One
Maximum speed	235 knots at 5,000 m (16,500 ft)
Cruising speed	160 knots
Range	Normal, 620 nautical miles; maximum, 960 nautical miles
Service ceiling	10,000 m (33,000 ft)
Bomb-load	Two 60-kg bombs could be carried
Armament	Two fuselage-mounted 7·7-mm. Type 97 machine-guns and two wing-mounted 20-mm. Type 99 cannon

Soon after work on the Kawanishi N1K1 seaplane fighter was put in hand, it became apparent to the naval authorities that the aircraft was not likely to be ready for some considerable time. To fill the gap, they instructed Nakajima to design a seaplane version of the Mitsubishi A6M2 Zero Fighter. A modified A6M2, without folding wing-tips and with undercarriage replaced by a large central float, was tested on the first day of hostilities against the Western Powers and received the designation A6M2–N. Production began almost immediately. In the following May a small force, covered and supported by the carrier forces which went on to fight the Battle of the Coral Sea, seized Tulagi in the Solomon Islands and established there a seaplane anchorage at which the first A6M2–Ns to be used in combat were based. Tulagi was, however, captured by the Allies three months later. Thereafter the A6M2–N was used largely in a defensive role for which it was not particularly suitable. It was also

58 Nakajima A6M2-N Naval Type 2 Floatplane Fighter. A seaplane version of the Mitsubishi A6M, it made its maiden flight on the first day of hostilities against the Western Powers. The Allies called it RUFE

used to train pilots converting to the N1K1. Rather more than 300 A6M2–Ns were completed between the last few weeks of 1941 and the autumn of 1943, when production ceased.

Nakajima B5N2

Official des.	Naval Type 97 Carrier-borne Attack-Bomber Model 12
Allied code name	Kate
Manufacturers	Nakajima Hikoki KK Aichi Tokei Denki KK Dai-Juichi Kaigun Kokusho
Description	Three-seater low-wing monoplane used as bomber and torpedo-bomber from carriers and land bases
Engine	1,000-h.p. Nakajima Sakae 11 air-cooled radial
Span	15·518 m (50 ft 11 in)
Length	10·3 m (33 ft 9 in)
Height	3·7 m (12 ft 2 in)
Wing area	37·7 sq m (406 sq ft)
Weight empty	2,279 kg (5,024 lb)
Weight loaded	3,800 kg (8,378 lb)
Crew	Three
Maximum speed	204 knots at 3,600 m (11,800 ft)
Cruising speed	140 knots at 3,000 m (10,000 ft)
Range	Normal, 528 nautical miles; maximum, 1,075 nautical miles
Service ceiling	8,260 m (27,000 ft)
Bomb-load	One 800-kg torpedo or equivalent weight of bombs
Armament	One flexibly mounted 7·7-mm. Type 92 machine-gun firing to the rear

59 (Below) Nakajima B5N2 Naval Type 97 Carrier-borne Attack Bomber. One of the most successful carrier-borne torpedo-bombers ever built, it was known to the Allies as KATE. The photograph shows a captured example with American markings

60 (Bottom) Nakajima B5N1 Naval Type 97 Carrier-borne Attack Bomber Model 1. Forerunner of the B5N2 and known to the Allies by the same code name, the B5N1 was in production from 1937 to 1941

The Nakajima B5N2 achieved pseudonymous fame on 7 December 1941, when carrier-borne torpedo-bombers known to the Western Allies as Kate played the leading part in crippling the United States Pacific Fleet at Pearl Harbor. In the battles of the Coral Sea, Midway Island and the Santa Cruz Islands in the following year, B5N2s damaged the *Lexington* so severely that she was afterwards disabled by internal explosions and sunk by her own side; scored hits on the *Yorktown* (sunk a few days later by a submarine); and sank the *Hornet*. The B5N2 continued to be used in an offensive role until 1944, and was then relegated to the less exacting task of convoy escort. Towards the end of the war a few B5N2s were used as substitutes for the B5N1–K trainer developed from their forerunner, the B5N1.

The genesis of the B5N1 was a specification of 1935 which called for a monoplane with a span of not more than 16 metres with wings extended and 7·5 metres with wings folded, capable of carrying an 800-kilogram torpedo at speeds up to 180 knots and of remaining airborne at 135 knots for not less than four hours. Katsuji Nakamura of Nakajima headed a team which produced by the end of 1936 an aircraft whose performance far exceeded these requirements. The B5N2, only fractionally faster but with a more reliable engine, was introduced in 1939. About 1,150 B5N1s and B5N2s were manufactured by Nakajima, Aichi and the 11th Naval Air Arsenal (Dai-Juichi Kaigun Kokusho) between 1936 and 1943.

Nakajima B6N Heavenly Mountain

Official des.	Naval Carrier-borne Attack-Bomber Heavenly Mountain Model 11, Model 12, Model 12A
Allied code name	Jill
Manufacturer	Nakajima Hikoki KK
Description	Three-seater carrier-borne torpedo-bomber of low-wing monoplane configuration
Engine	B6N1: 1,800-h.p. Nakajima Mamoru 11 air-cooled radial B6N2: 1,850-h.p. Mitsubishi Kasei 25 air-cooled radial
Span	14·894 m (48 ft 10 in)
Length	B6N1: 10·365 m (34 ft) B6N2: 10·865 m (35 ft 8 in)
Height	B6N1: 3·7 m (12 ft 2 in) B6N2: 3·8 m (12 ft 6 in)
Wing area	37·2 sq m (400 sq ft)
Weight empty	B6N1: 3,223 kg (7,105 lb) B6N2: 3,010 kg (6,636 lb)
Weight loaded	5,200 kg (11,464 lb)
Crew	Three

Maximum speed	B6N1: 251 knots at 4,800 m (15,750 ft) B6N2: 260 knots at 4,900 m (16,000 ft)
Cruising speed	180 knots at 4,000 m (13,000 ft)
Normal range	B6N1: 790 nautical miles B6N2: 943 nautical miles
Maximum range	B6N1: 1,861 nautical miles B6N2: 1,644 nautical miles
Service ceiling	B6N1: 8,650 m (23,400 ft) B6N2: 9,040 m (29,700 ft)
Bomb-load	One 800-kg torpedo or an equivalent weight of bombs
Armament	Models 11 and 12: One 7·7-mm. Type 97 machine-gun firing through a ventral tunnel and one firing to the rear Model 12A: One 7·7-mm. Type 97 machine-gun firing through a ventral tunnel and one 13-mm. Type 2 machine-gun firing to the rear

The Nakajima B6N *Tenzan*, or Heavenly Mountain, was intended as a successor to the B5N2 and closely resembled its forerunner. Two prototypes were tested in the spring of 1941, but technical troubles arising largely from the use of an almost untried engine delayed the start of production until the early part of 1943. Only about 130 B6N1s were completed before Nakajima switched to the B6N2. Having been ordered by the authorities to suspend production of the Mamoru 11 engine, they used for the new version the Mitsubishi Kasei 25. About 1,100 B6N2s were built between the summer of 1943 and the end of the war. Two B6N2 airframes with Kasei 25c engines were used as prototypes of a projected B6N3 or Model 13, but no production aircraft were built. Carrier-borne torpedo-bomber units were re-equipped with B6Ns in time for the Battle of the Philippine Sea in the summer of 1944, but the carrier force was outmanoeuvred and suffered crippling losses. During the last two years of the war the B6N had few opportunities of proving its worth in the role for which it was designed. Most of the B6N2s built after the summer of 1943 went into action against hopeless odds or were sacrificed in suicide attacks.

61 (Left) Nakajima B6N Naval Carrier-borne Attack Bomber *Tenzan* (Heavenly Mountain). This one has caught fire after attacking the *Yorktown* during an Allied raid on the Caroline Islands in 1944. The Allied code name was JILL

62 (Below) Nakajima C6N Naval Carrier-borne Reconnaissance Aircraft *Saiun* (Painted Cloud). Intended in the first instance to reconnoitre from carriers and used in modified form as a night-fighter, the C6N was known to the Allies as MYRT

Nakajima C6N Painted Cloud

Official des.	Naval Carrier-borne Reconnaissance Aircraft Painted Cloud Model 11
Allied code name	Myrt
Manufacturer	Nakajima Hikoki KK
Description	Single-engine low-wing monoplane designed for long-range reconnaissance from carriers but used also as night fighter
Engine	1,990-h.p. Nakajima Homare 21 air-cooled radial
Span	12·5 m (41 ft)
Length	11 m (36 ft 1 in)
Height	3·96 m (13 ft)
Wing area	25·5 sq m (274 sq ft)
Weight empty	2,968 kg (6,543 lb)
Weight loaded	4,500 kg (9,921 lb)
Crew	C6N1: Three C6N1–S: Two
Maximum speed	329 knots at 6,100 m (20,000 ft)
Cruising speed	210 knots
Range	Normal, 1,633 nautical miles; maximum, 2,866 nautical miles
Service ceiling	10,470 m (35,250 ft)
Bomb-load	None
Armament	C6N–1: One 7·92-mm. Type 2 machine-gun firing to the rear C6N1–S: Two 20-mm. Type 99 cannon, each firing at an angle to the line of flight

The Nakajima C6N *Saiun*, or Painted Cloud, was designed to reconnoitre from carriers at ranges beyond the reach of seaplanes launched from accompanying cruisers or battleships, so that torpedo-bombers would not have to be misemployed as long-range reconnaissance aircraft. The prototype first flew in the late spring of 1943 and production began about ten months later, after nineteen prototype or pre-production aircraft had been completed. The C6N1 Model 11 was first used to shadow a hostile fleet on the eve of the Battle of the Philippine Sea in the summer of 1944. A few C6N1s were modified as night fighters and given the designation C6N1–S. A torpedo-bomber version, to be called the Model 21, was projected but not put into production, and experiments were made with a version powered by a turbosupercharged Nakajima Homare 24 engine. Other variants, including an all-wooden C6N6, were planned but not built. About 460 C6Ns were completed between 1943 and 1945.

Nakajima E8N2

Official des.	Naval Type 95 Reconnaissance Seaplane Model 2
Allied code name	Dave
Manufacturers	Nakajima Hikoki KK Kawanishi Kokuki KK
Description	Two-seater catapult-launched seaplane of biplane configuration with large central float
Engine	630-h.p. Nakajima Kotobuki 2 KAI air-cooled radial
Span	10·98 m (36 ft)

63 (Below) Nakajima E8N Naval Type 95 Reconnaissance Seaplane. Designed as a spotter and general reconnaissance aircraft for launching by catapult from battleships, cruisers and seaplane tenders, it first flew in 1934 and remained in production until 1940. The Allies gave it the code name DAVE

Length	8·81 m (28 ft 11 in)
Height	3·84 m (12 ft 7 in)
Wing area	26·5 sq m (285 sq ft)

Developed from the Nakajima E8N1 of 1934, the E8N2 had a maximum speed of 162 knots at 3,000 metres, a cruising speed of 100 knots and a range of 485 nautical miles. Production ceased in 1940, but the E8N2 continued to be used during the first year of the war between Japan and the Western Powers as a spotter for ships' guns, for general reconnaissance and occasionally as a dive-bomber carrying two 30-kilogram bombs. After its replacement in first-line units by the Aichi E13A1 and the Mitsubishi F1M2 it served as a communications aircraft and sometimes as a trainer. About 750 E8N1s and E8N2s were built between 1934 and 1940.

Nakajima G5N2-L

Official des.	Mountain Recess Modified Model 12 Transport Aircraft
Allied code name	Liz
Manufacturer	Nakajima Hikoki KK
Description	Large mid-wing monoplane intended as long-range heavy bomber or torpedo-bomber and used in modified form as freight-carrier
Engines	Four 1,530-h.p. Mitsubishi Kasei 12 air-cooled radials
Span	42·14 m (138 ft 3 in)
Length	31·02 m (101 ft 9 in)
Wing area	201·8 sq m (2,172 sq ft)

Before the outbreak of war between Japan and the Western Allies, Nakajima made an unsuccessful attempt to develop for the naval authorities a heavy bomber or torpedo-bomber of extreme range based on the Douglas DC-4E transport aircraft. The sole prototype of the DC-4E was acquired by Nippon Koku and secretly handed over to Nakajima. A prototype with the designation G5N1, or Experimental 13-Shi Attack-Bomber Mountain Recess, was completed in 1939, but its performance was poor. Three more G5N1 prototypes, powered like the first by Nakajima Mamoru 11 air-cooled radials, were built, and these were followed by two G5N2 prototypes with Kasei 12 engines. Such large aircraft were, however, new to the Japanese aircraft industry, and Nakajima were unlucky in being given as a model one of the least successful aircraft built by Douglas. Eventually the project was abandoned. The two G5N2s, and also two G5N1s updated by the installation of Kasei 12 engines, were then taken over by the navy as freight-carriers. The Allied code name for the G5N2 was bestowed in the expectation that it would turn out to be a bomber.

64 (Right) Nakajima J1N1 Naval Type 2 Reconnaissance Aircraft. Used not only in the role for which it was first intended but also as a fighter, the J1N1 was in production from the summer of 1942 until the end of the war. The Allies, meeting the fighter version, called the aircraft IRVING

Nakajima G8N Mountain Range

Official des.	Naval Experimental 18-Shi Attack-Bomber Mountain Range
Allied code name	Rita
Manufacturer	Four prototype aircraft built by Nakajima Hikoki KK
Description	Large mid-wing monoplane intended as long-range bomber and torpedo-bomber
Engines	Four 2,000-h.p. Nakajima Homare 24 air-cooled radials
Span	32·54 m (106 ft 9 in)
Length	22·935 m (75 ft 3 in)
Height	7·2 m (23 ft 8 in)
Wing area	112 sq m (1,206 sq ft)

The Nakajima G8N *Renzan*, or Mountain Range, was designed to meet a specification which called for an aircraft with a maximum speed of 320 knots and a range of 2,000 nautical miles with a 4,000 kilogram bomb-load or twice that distance with reduced bomb-load. Four prototypes with turbosupercharged Homare 24 radials were built by the autumn of 1944 and an output of forty-eight aircraft by September 1945 was predicted. One of the prototypes was destroyed on the ground by United States naval aircraft, and a shortage of raw materials prevented Nakajima from giving effect to the production programme.

Nakajima J1N1

Official des.	J1N1-C: Naval Type 2 Reconnaissance Aircraft J1N1-S: Naval Night-Fighter Moonlight Model 11, 11A
Allied code name	Irving
Manufacturer	Nakajima Hikoki KK
Description	Three-seater twin-engine low-wing monoplane designed in first instance as land-based escort fighter but redesigned as long-range reconnaissance aircraft and used also in modified form as two-seater night fighter
Engines	Two 1,130-h.p. Nakajima Sakae 21 air-cooled radials
Span	16·98 m (55 ft 9 in)
Length	J1N1-C: 12·18 m (40 ft) J1N1-S: 12·77 m (41 ft 11 in)
Height	4·562 m (15 ft)
Wing area	40 sq m (431 sq ft)
Weight empty	J1N1-C: 4,852 kg (10,697 lb) J1N1-S: 4,840 kg (10,670 lb)
Weight loaded	J1N1-C: 6,890 kg (15,190 lb) J1N1-S: 7,010 kg (15,454 lb)
Crew	J1N1-C: Three J1N1-S: Two
Maximum speed	J1N1-C: 286 knots at 6,000 m (20,000 ft) J1N1-S: 274 knots at 5,840 m (19,000 ft)
Cruising speed	J1N1-C: 150 knots at 4,000 m (13,000 ft) J1N1-S: 180 knots at 4,000 m (13,000 ft)
Range	Normal, 1,457 nautical miles; maximum (J1N1-S only), 2,040 nautical miles
Service ceiling	J1N1-C: 10,300 m (33,800 ft) J1N1-S: 9,320 m (30,600 ft)
Bomb-load	None
Armament	J1N1-C: Normally, one 13-mm. Type 2 machine-gun firing to the rear, but sometimes one 20-mm. Type 99 Model 1 cannon in dorsal turret Model 11: Two upward-firing and two downward-firing 20-mm. Type 99 cannon Model 11A: Two upward-firing 20-mm. Type 99 cannon and sometimes one similar cannon firing forwards

In 1941 Nakajima submitted for trial by the naval authorities two prototypes of a twin-engine low-wing monoplane intended to meet the demand that then existed for a long-range escort fighter. They proved unsatisfactory in almost every respect except that they were very fast. With the approval of the authorities, Nakajima then redesigned the aircraft as a long-range reconnaissance machine. The new version, designated the J1N1-C by its makers but widely known in naval circles as the J1N1-R, was accepted for production in the summer of 1942. Some units adapted the J1N1-C for night fighting by modifying its armament and some J1N1-Cs similarly modified by Nakajima received the designation J1N1-C KAI. In 1943 a special night fighter version, the J1N1-S *Gekko*, or Moonlight, went into production with the designation Naval Night-Fighter Moonlight Model 11. The Model 11A, or J1N1-Sa, differed from the Model 11 only in its armament. About 470 J1N1s were built between 1942 and the end of 1944, when production ceased.

Nakajima Orange Blossom

Official des.	Naval Special Attacker Orange Blossom
Allied code name	None
Manufacturer	Two prototype aircraft built by Nakajima Hikoki KK
Description	Single-seater monoplane jet fighter based on the Messerschmitt Me 262
Engines	Two Ne-20 axial-flow turbojets
Span	10 m (32 ft 10 in)
Length	8·125 m (26 ft 8 in)
Height	2·95 m (9 ft 8 in)
Wing area	13·2 sq m (142 sq ft)

The Nakajima *Kikka*, or Orange Blossom, was designed by Kazuo Ohno and Kenichi Matsumura in the light of descriptions of the Messerschmitt Me 262. The Ne-20 jet engines were based on the BMW 003 axial-flow turbojet. Two prototypes were built. The first made its maiden flight on 7 August 1945. A second flight was attempted a few days later, but the take-off was unsuccessful. The other prototype did not fly. The aircraft was expected to attain a speed of 433 miles an hour at 33,000 feet. Its estimated range in still air was 509 nautical miles.

Nakajima Ki–27

Official des.	Army Type 97 Fighter Model A, Model B
Allied code name	Nate (formerly Abdul or Nate)
Manufacturers	Nakajima Hikoki KK Mansyu Hikoki Seizo KK
Description	Single-seater fighter of low-wing monoplane configuration with fixed spatted undercarriage
Engine	Army Type 97 (Nakajima Ha–1b) air-cooled radial nominally of 650-h.p. but delivering 780-h.p. at 2,900 m (9,500 ft)
Span	11·31 m (37 ft 1 in)
Length	7·53 m (24 ft 8 in)
Height	3·25 m (10 ft 8 in)
Wing area	18·6 sq m (200 sq ft)
Weight empty	1,110 kg (2,447 lb)
Weight loaded	1,790 kg (3,946 lb)
Crew	One
Maximum speed	470 km/h at 3,500 m (292 m.p.h. at 11,500 ft)
Cruising speed	350 km/h at 3,500 m (217 m.p.h. at 11,500 ft)
Range	Normal, 627 km (390 miles); maximum with drop-tanks, 1,710 km (1,060 miles)
Service ceiling	Not known
Bomb-load	Ki–27b could carry four 25-kg bombs in place of drop tanks
Armament	Two fuselage-mounted 7·7-mm. Type 89 machine-guns

The Ki–27 first flew in prototype form in 1936. In the following year it went into production as the Ki–27a or Army Type 97 Fighter Model A. The Ki–27b, or Model B, was very similar but could carry four 25-kilogram bombs or two 130-litre drop-tanks. During the first two years of war with the Western Powers Ki–27s were used in the Philippines, Malaya, Burma, and the Netherlands East Indies and for home defence. They remained in service in China and Manchukuo until the end of the war. Despite their modest performance and feeble armament more than 2,000 were manufactured by Nakajima and nearly 1,400 by the Manchurian-based Mansyu Hikoki Seizo. Towards the end of the war a number of Ki–27s with wheel-spats removed were used as advanced trainers with the designation Army Type 97 Fighter Trainer, and some of these were despatched on suicide missions.

Nakajima Ki–34

Official des.	Army Type 97 Transport Aircraft Naval Type AT–2 Transport Aircraft
Allied code name	Thora
Manufacturers	Nakajima Hikoki KK Tachikawa Hikoki KK
Description	Twin-engine transport aircraft designed for civilian use and adopted by the armed forces
Engines	Two 780-h.p. Nakajima Kotobuki 41 or Ha–1b air-cooled radials
Span	19·916 m (65 ft)
Length	15·3 m (50 ft 2 in)
Height	4·15 m (13 ft 7 in)
Wing area	49·2 sq m (530 sq ft)

Between 1937 and 1940 Nakajima built 41 AT–2 transport aircraft for Dai Nippon Koku KK and the Manchurian Airline Company. These remained in

65 Nakajima Ki-34 Army Type 97 Transport Aircraft. Inspired by the Douglas DC-2 and other passenger or freight-carrying aircraft of American origin, the Ki-34 was used not only by the army but also by the navy and as a civil aircraft. The navy called it the L1N1, the civil authorities the AT-2. The Allies applied the code name THORA to all versions

service during the Second World War. Nakajima also built nineteen similar aircraft for the military authorities, and a further 299 were built by Tachikawa. Of these 318 aircraft, some were used by the army as communications aircraft and to carry paratroops, some taken over by the navy. They differed from the original version in using Nakajima Kotobuki 41 or Ha–1b instead of Kotobuki 2–1 engines. A three-man crew and eight passengers were carried.

Nakajima Ki–43 Peregrine Falcon

Official des.	Army Type 1 Fighter Peregrine Falcon Model 1A, 1B, 1C, 2A, 2B, 3A
Allied code name	Oscar (also called Jim)
Manufacturers	Nakajima Hikoki KK Tachikawa Hikoki KK Tachikawa Dai-Ichi Rikugun Kokusho
Description	Single-seater fighter and fighter-bomber of low-wing monoplane configuration with retractable undercarriage
Engine	Ki–43–I: 950-h.p. Army Type 99 (Nakajima Ha–25) air-cooled radial Ki–43–II: 1,150-h.p. Army Type 1 (Nakajima Ha–115) air-cooled radial Ki–43–IIIa: 1,150-h.p. Army Type 1 (Nakajima Ha–115–II) air-cooled radial delivering 1,230 h.p. at 2,800 m
Span	Earlier models: 11·437 m (37 ft 6 in) Later models: 10·84 m (35 ft 7 in)
Length	Earlier models: 8·832 m (29 ft) Later models: 8·92 m (29 ft 3 in)
Height	3·27 m (10 ft 9 in)
Wing area	Earlier models: 22 sq m (237 sq ft) Later models: 21·4 sq m (230 sq ft)
Weight empty	Earlier models: 1,580 kg (3,483 lb) Later models: 1,910–1,920 kg (4,211–4,233 lb)
Weight loaded	Earlier models: 2,048 kg (4,515 lb) Later models: 2,560–2,590 kg (5,644–5,710 lb)
Crew	One
Maximum speed	Ki–43–I: 495 km/h at 4,000 m (308 m.p.h. at 13,000 ft) Ki–43–II: 530 km/h at 4,000 m (329 m.p.h. at 13,000 ft) Ki–43–IIIa: 576 km/h at 6,680 m (358 m.p.h. at 22,000 ft)
Cruising speed	Ki–43–I: 320 km/h at 2,500 m (199 m.p.h. at 8,200 ft) Ki–43–II: 440 km/h (273 m.p.h.) Ki–43–IIIa: 442 km/h (275 m.p.h.)
Range	Ki–43–I: 1,200 km (745 miles) Ki–43–II: 1,760 km (normal) to 3,200 km (maximum) (1,095 to 1,990 miles) Ki–43–IIIa: 2,120 km (normal) to 3,200 km (maximum) (1,320 to 1,990 miles)
Service ceiling	Ki–43–I: 11,750 m (38,500 ft) Ki–43–II: 11,200 m (36,750 ft) Ki–43–IIIa: 11,400 m (37,400 ft)
Bomb-load	Ki–43–I: Two 15-kg bombs Later models: Two 30-kg bombs (normal) or two 250-kg bombs (maximum)
Armament	Ki–43–I: Two 7·7-mm Type 89 machine-guns or one 7·7-mm. Type 89 and one 12·7-mm. Type 1 machine-gun (Ki–43–Ib) Ki–43–Ic and all later production models: Two 12·7-mm. Type 1 machine-guns

66 & 67 Nakajima Ki-43 Army Type 1 Fighter *Hayabusa* (Peregrine Falcon) in flight (66) and with engine and cowling removed after a crash (67). Code-named OSCAR by the Allies, the *Hayabusa* was capable in its final form of well over 350 miles an hour. It was manufactured in larger numbers than any other first-line aircraft used by the army. See also Colour Section (IX)

The Nakajima Ki-43 *Hayabusa*, or Peregrine Falcon, was designed by a team led by Hideo Itokawa to meet a specification which called for a fighter with a maximum speed of not less than 500 kilometres an hour, a range of 800 kilometres and the ability to climb to 5,000 metres in five minutes. The prototype first flew in January 1939. Production of the Ki-43-Ia, or Model 1A, began in the spring of 1941. With its retractable undercarriage and brisk performance, the *Hayabusa* made a powerful impression on the Western Allies when it first appeared over Malaya and Burma early in the war. No protective armour for the pilot was, however, provided until the Ki-43-II went into production nearly a year later. Moreover, the fuel tanks even of the Ki-43-II, although not quite as vulnerable as those of the Ki-43-I, were only partially self-sealing. In spite of these shortcomings and its modest hitting-power, the Ki-43 remained in production throughout the war and was manufactured in larger numbers than any other aircraft used by the Japanese Army. Some 700 Ki-43-Is and nearly 2,500 Ki-43-IIs and IIIas were completed by Nakajima; about fifty Ki-43-IIas by the First Army Air Arsenal (Tachikawa Dai-Ichi Rikugun Kokusho); more than 2,600 Ki-43-IIs and IIIas by Tachikawa Hikoki. A cannon version of the Ki-43-III, powered by a 1,250-h.p. Mitsubishi Ha-112 engine, was tested in prototype form but did not go into production.

Height	3·25 m (10 ft 8 in)
Wing area	15 sq m (161 sq ft)
Weight empty	Earlier models: 1,944 kg (4,286 lb) Later models: 2,106 kg (4,643 lb)
Weight loaded	Earlier models: 2,550 kg (5,622 lb) Later models: 2,764 kg (6,094 lb)
Crew	One
Maximum speed	Earlier models: 580 km/h at 3,700 m (360 m.p.h. at 12,100 ft) Later models: 605 km/h at 5,200 m (376 m.p.h. at 17,000 ft)
Cruising speed	400 km/h at 4,000 m (249 m.p.h. at 13,000 ft)
Normal Range	Ki-44-I: 926 km (575 miles) Later models: 1,296 km (805 miles)
Maximum range	1,700 km (1,060 miles)
Service ceiling	Ki-44-I: 10,820 m (35,500 ft) Later models: 11,200 m (36,750 ft)
Bomb-load	None
Armament	Models 1A and 2A: Two fuselage-mounted 7·7-mm. Type 89 and two wing-mounted 12·7-mm. Type 1 machine-guns Models 1B, 1C and 2B: Two fuselage-mounted and two wing-mounted 12·7-mm. Type 1 machine-guns Model 2C: Two fuselage-mounted and two wing-mounted 20-mm. Ho-3 cannon, or two fuselage-mounted 12·7-mm. Type 1 machine-guns and two wing-mounted 37-mm. Ho-203 or 40-mm. Ho-301 cannon Model 3A: Two fuselage-mounted and two wing-mounted 20-mm. Ho-5 cannon Model 3B: Two fuselage-mounted 20-mm. Ho-5 and two wing-mounted 37-mm. Ho-203 cannon

Nakajima Ki-44 Demon

Official des.	Army Type 2 Single-Seater Fighter Demon Model 1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B
Allied code name	Tojo
Manufacturer	Nakajima Hikoki KK
Description	Single-seater interceptor fighter of low-wing monoplane configuration
Engine	Ki-44-I: 1,250-h.p. Army Type 100 (Nakajima Ha-41) air-cooled radial Ki-44-II: 1,450-h.p. Army Type 2 (Nakajima Ha-109) air-cooled radial Ki-44-III: 2,000-h.p. Nakajima Ha-145 air-cooled radial
Span	9·45 m (31 ft)
Length	Earlier models: 8·75 m (28 ft 9 in) Later models: 8·785 m (28 ft 10 in)

The Nakajima Ki-44 *Shoki*, or Demon, first flew in prototype form in August 1940. It failed to attain the speed and rate of climb laid down by the military authorities. Substantial modifications were made before production was formally authorized in the autumn of 1942. By that time Nakajima had been working for some months on a first batch of production aircraft which afterwards received the

68 (Below) Nakajima Ki-44 Army Type 2 Single-Seater Fighter *Shoki* (Demon). An interceptor fighter intended primarily for home defence, the *Shoki* in its final form had a maximum speed of roughly 376 miles an hour and could climb to 5,000 metres in 4 minutes 17 seconds. When the Allies first met it over China they called it TOJO, after the Japanese Prime Minister and Minister of War, and that designation was retained as its official code name

69 (Right) Nakajima Ki-49 Army Type 100 Heavy Bomber *Donryu* (Storm Dragon). The photograph shows Allied officers inspecting two captured Ki-49s; a third is in the background. The Allied code name was HELEN

designation Army Type 2 Single-Seater Fighter Demon Model 1A. Except that they were more heavily armed, Models 1B and 1C differed only minutely from Model 1A. With its maximum speed of roughly 360 miles an hour, the Ki–44–I was the fastest Japanese fighter in service in 1942, but it was not fast enough to intercept the Mitsubishi Ki–46–II strategic reconnaissance aircraft or to satisfy Nakajima. Its manufacture ceased after only forty production aircraft had been completed.

The Ki–44–II, powered by the Ha–109 engine – officially rated at 1,450-h.p. but developing 1,520 h.p. at take-off – was far more satisfactory. About 1,000 production aircraft of this series, most of them Ki–44–IIbs with the same armament as the Model 1B and 1C, were completed between the early winter of 1942 and the end of 1944. They could climb to 5,000 metres in just over four and a quarter minutes and were very fast at that altitude. They were, however, rather deficient in hitting power, and such protection as was provided for pilot and fuel tanks was not very effective. The Ki–44–IIc or Model 2C, normally armed with four 20-millimetre cannon although other weapons were tried, was a more formidable bomber-destroyer than its forerunners, but neither the Model 2C nor the Model 3 in either of its variants was manufactured in large numbers.

Nakajima Ki–49 Storm Dragon

Official des.	Army Type 100 Heavy Bomber Model 1, 2A, 2B
Allied code name	Helen
Manufacturers	Nakajima Hikoki KK Tachikawa Hikoki KK
Description	Twin-engine heavy bomber of mid-wing monoplane configuration
Engines	Ki–49–I: Two 1,250-h.p. Army Type 100 (Nakajima Ha–41) air-cooled radials Ki–49–II: Two 1,450-h.p. Army Type 2 (Nakajima Ha–109) air-cooled radials
Span	20·424 m (67 ft)
Length	Ki–49–I: 16·808 m (55 ft 2 in) Ki–49–II: 16·5 m (54 ft 2 in)
Height	4·25 m (13 ft 11 in)
Wing area	69·1 sq m (743 sq ft)
Weight empty	Ki–49–I: 6,070 kg (13,382 lb) Ki–49–II: 6,530 kg (14,396 lb)
Weight loaded	Ki–49–I: 10,150 kg (22,377 lb) Ki–49–II: 10,680 kg (23,545 lb)
Crew	Eight
Maximum speed	Ki–49–I: Not known Ki–49–II: 492 km/h at 5,000 m (306 m.p.h. at 16,400 ft)
Cruising speed	Ki–49–I: Not known Ki–49–II: 350 km/h at 3,000 m (217 m.p.h. at 10,000 ft)
Range	Ki–49–I: Not known Ki–49–II: Normal, 2,000 km (1,240 miles); maximum, 2,950 km (1,830 miles)
Service ceiling	Ki–49–I: Not known Ki–49–II: 9,300 m (30,500 ft)
Bomb-load	Normal, 750 kg; maximum, 1,000 kg
Armament	Models 1 and 2A: One 20-mm. Ho–1 cannon in dorsal turret, five 7·7-mm. Type 89 machine-guns in forward, ventral, tail, and port and starboard beam positions Model 2B: One 20-mm. Ho–1 cannon in dorsal turret, three 12·7-mm. Type 1 machine-guns in forward, ventral and tail positions, two 7·7-mm. Type 89 machine-guns in port and starboard beam positions.

The Nakajima Ki–49 *Donryu*, or Storm Dragon, was intended as a successor to the Mitsubishi Ki–21 heavy bomber, but never entirely replaced that aircraft. The prototype made its maiden flight in August 1939 and the first production aircraft were delivered two years later. Pilots complained that, although faster than the Ki–21, the Ki–49–I was more difficult to fly, and in any case was not fast enough to escape interception. The Ki–49–II, powered by two Nakajima Ha–109 engines, replaced the Ki–49–I after only 129 production aircraft of the Model 1 series had been built. Between the autumn of 1942 and the end of 1944 some 600 Ki–49–IIs were completed by Nakajima, about fifty by Tachikawa Hikoki. Units equipped with them suffered heavy losses during the Allied advance to the Philippines, and after the American landings in the Gulf of Leyte most surviving aircraft of the series were relegated to suicide attacks or employed as troop transports or submarine-spotters. A few were modified as night fighters. Six Ki–49s powered by 2,420-h.p. Nakajima Ha–117 engines were built in 1943 and given the designation Ki–49–III, but this variant never emerged from the experimental stage.

Nakajima Ki–84 Gale

Official des.	Army Type 4 Fighter Gale Model 1A, 1B, 1C
Allied code name	Frank
Manufacturers	Nakajima Hikoki KK Mansyu Hikoki Seizo KK
Description	Single-seater fighter and fighter-bomber of low-wing monoplane configuration
Engine	1,900-h.p. Army Type 4 (Nakajima Ha–45) air-cooled radial
Span	11·238 m (36 ft 10 in)
Length	9·92 m (32 ft 7 in)
Height	3·385 m (11 ft 1 in)
Wing area	21 sq m (226 sq ft)
Weight empty	2,660 kg (5,864 lb)
Weight loaded	3,613 kg (7,955 lb)
Crew	One
Maximum speed	631 km/h at 6,120 m (392 m.p.h. at 20,000 ft)
Cruising speed	445 km/h (277 m.p.h.)
Range	Normal, 1,695 km (1,050 miles); maximum, 2,168 km (1,345 miles)
Service ceiling	10,500 m (34,500 ft)
Bomb-load	Two 250-kg bombs could be carried in place of drop-tanks
Armament	Model 1A: Two fuselage-mounted 12·7-mm. Type 1 machine-guns and two wing-mounted 20-mm. Ho–5 cannon Model 1B: Two fuselage-mounted and two wing-mounted 20-mm. Ho–5 cannon Model 1C: Two fuselage-mounted 20-mm. Ho–5 and two wing-mounted 30-mm. Ho–105 cannon

The Nakajima Ki–84 *Hayate*, or Gale, was designed to meet a specification which called for a 398-mile-an-hour armoured long-range fighter with self-sealing fuel tanks. When tested in 1943 the prototype fell short by ten miles an hour of the stipulated figure, but climbed to 16,400 feet in less than six and a half minutes and reached a ceiling of well over 40,000 feet. Large-scale production began in the spring of 1944 and continued until the end of the war. During that time more than three and a quarter thousand Ki–84s were built by Nakajima and just under a hundred by Mansyu Hikoki Seizo. The Model 1A was credited with a maximum speed of 392 miles an hour at 20,000 feet, but a captured and restored Ki–84 tested in the United States in 1946 reached 427 miles an hour, beating the P–51D Mustang by a small margin and the P–47D Thunderbolt by a substantial one. Towards the end of the war some aircraft of the 1B and 1C series were constructed partly of wood, and experiments were made with an all-wooden version designed by Tachikawa and built for them by Ohji Koku KK of Ebetsu. Three wooden prototypes were given the designation Ki–106. As another way of saving aluminium one aircraft of Ki–84 configuration, designated the Ki–113, was built of steel, but it was not tried in the air. The Ki–48–III, to be powered by a Nakajima Ha–45 Ru engine with turbosupercharger, was planned but never built, and a Mitsubishi-powered version of the Ki–84–I which received the designation Ki–116 was still on trial at the end of the war.

Rikugan Ki-93

Official des.	Army Experimental Fighter and Ground-Attack Aircraft Ki–93
Allied code name	None
Manufacturer	Two prototype aircraft built by Dai-Ichi Rikugun Kokusho
Description	Two-seater twin-engine heavy fighter and ground-attack aircraft of mid-wing monoplane configuration
Engines	Two 2,400-h.p. Mitsubishi Ha–214 air-cooled radials
Span	19 m (62 ft 4 in)
Length	14·215 m (46 ft 8 in)
Height	4·85 m (15 ft 11 in)
Wing area	54·8 sq m (589 sq ft)

The Ki–93 was designed by the Army Aerotechnical Research Institute (Rikugun Kokugijutsu Kenkyujo) to carry one 57-millimetre and two 20-millimetre cannon in heavy fighter and one 75-millimetre cannon in ground-attack form, in each case with the addition of one 12·7-millimetre machine-gun. Two prototypes were built by the First Army Air Arsenal (Dai-Ichi Rikugun Kokusho) at Tachikawa, and the first was tested in April 1945. The second had yet to fly when Japan surrendered.

70 Nakajima Ki-84 Army Type 4 Fighter *Hayate* (Gale). Fast, well armoured and powerfully armed, the *Hayate* ranks as the best aircraft of its class produced in substantial numbers by the Japanese during the war. The Allies called it FRANK. See also Colour Section (VI, VII and VIII)

Tachikawa Aircraft

Tachikawa Ki-9

Official des.	Army Type 95-1 Medium Grade Trainer Model A, Model B
Allied code name	Spruce
Manufacturers	Tachikawa Hikoki KK Tokyo Koku KK
Description	Two-seater intermediate trainer of biplane configuration with fixed undercarriage
Engine	350-h.p. Army Type 95 (Hitachi Ha-13a) air-cooled radial
Span	10·32 m (33 ft 10 in)
Length	7·525 m (24 ft 8 in)
Height	3 m (9 ft 10 in)
Wing area	24·5 sq m (264 sq ft)

In 1933 the military authorities tested a primary trainer built as a private venture by Tachikawa Hikoki KK. They rejected it as too small for their needs, but invited Tachikawa in the following year to design an aircraft which could be used, with different engines, both as a primary and as an intermediate trainer. The firm submitted two prototypes powered by Hitachi Ha-13 engines and one powered by a Nakajima NZ engine rated at 150 h.p. After testing them the authorities gave up the idea of using the same airframe for two aircraft intended to serve different purposes and accepted the first two prototypes as the basis of a production order for an intermediate trainer. More than 2,250 Ki-9 intermediate trainers were completed by Tachikawa between 1935 and 1942, a further 220 by Tokyo Koku in 1944 and 1945. Two models were built, the second of which (Model B) was lighter and had a stronger undercarriage than the first. The aircraft had a top speed of roughly 150 miles an hour and could cruise at ninety miles an hour for three and a half hours.

Tachikawa Ki-17

Official des.	Army Type 95-3 Primary Trainer
Allied code name	Cedar
Manufacturer	Tachikawa Hikoki KK
Description	Two-seater primary trainer of biplane configuration with fixed undercarriage
Engine	150-h.p. Army Type 95 (Hitachi Ha-12) air-cooled radial
Span	8·82 m (32 ft 3 in)
Length	7·8 m (25 ft 7 in)
Height	2·95 m (9 ft 8 in)
Wing area	26 sq m (280 sq ft)

71 (Top) Tachikawa Ki-9 Army Type 95-1 Medium Grade Trainer. Designed by Ryokichi Endo of Tachikawa after an aircraft offered by the firm as a primary trainer had been turned down as too small, the Ki-9 – code-named SPRUCE by the Allies – proved so successful that more than 2,500 aircraft of the production series were built. The photograph shows the Model B (Ki-9 KAI)

72 (Above) Tachikawa Ki-17 Army Type 95-3 Primary Trainer. Designed in 1935 and put into production in the same year, the Ki-17 continued to be manufactured until 1944. It was known to the Allies as CEDAR

A logical consequence of the acceptance by the military authorities of the Tachikawa Ki-9 and their decision not to use it as the basis of both a primary and an intermediate trainer was that Tachikawa received not only a production order for the Type 95-1 Medium Grade Trainer but also an invitation to design a primary trainer distinct from it. The outcome was the Ki-17, a biplane with upper and lower wings of equal span and a laden weight of well under a ton. About 560 Ki-17s, including two prototypes, were built by Tachikawa between 1935 and 1944.

Tachikawa Ki-36 and Ki-55

Official des.	Army Type 98 Direct Co-operation Aircraft Army Type 99 Advanced Trainer
Allied code name	Ida
Manufacturers	Tachikawa Hikoki KK Kawasaki Kokuki Kogyo KK
Description	Two-seater low-wing monoplane designed as army co-operation aircraft but also used, under different designation and with minor modifications, as advanced trainer
Engine	450-h.p. Army Type 98 (Hitachi Ha-13a) air-cooled radial
Span	11·8 m (38 ft 9 in)
Length	8 m (26 ft 3 in)
Height	3·64 m (11 ft 11 in)
Wing area	20 sq m (215 sq ft)

The Ki-36 was built to a specification which called for an army co-operation aircraft of monoplane configuration, capable of operating from rough airstrips and of carrying both photographic equipment and small bombs. Designed by Ryokichi Endo of Tachikawa, it had a fixed spatted undercarriage, a maximum speed in the region of 215 to 220 miles an hour and a service ceiling of approximately 27,000 feet. About 800 aircraft of the production series were built by Tachikawa between 1938 and 1944, a further 425 or so by Kawasaki between 1940 and 1942. Ki-36s were used throughout the undeclared war with China for tactical and artillery reconnaissance and close support of troops. They were also used in 1941 and 1942 in South-East Asia and the Pacific theatre, but proved highly vulnerable to Allied fighters.

The Ki-55 was substantially the same aircraft, modified by the omission of wheel-spats and of internal equipment not needed in an advanced trainer. Tachikawa built about 1,000 of these aircraft between 1939 and 1943, Kawasaki some 300. Both Ki-36s and Ki-55s were used towards the end of the war as suicide bombers, carrying a single 250- or 500-kilogram bomb. An advanced version of the Ki-36 with a 600-h.p. engine and a retractable undercarriage was planned but not built.

73 Tachikawa Ki-36 Army Type 98 Direct Co-Operation Aircraft. Introduced to active service during the undeclared war between Japan and China, the Ki-36 was found so useful that it did not go out of production until the early part of 1944. A training version, the Ki-55, was almost identical in appearance except that it had no wheel-spats. The Allies called both versions IDA

74 Tachikawa Ki-54a Army Type 1 Advanced Trainer Model A. This was an early production model. It was succeeded by the 54b (Army Type 1 Operations Trainer Model B) and the 54c (Army Type 1 Transport Aircraft Model C). There was also a Model D, built only in small numbers. The Allies applied the code name HICKORY to all versions

Tachikawa Ki–54

Official des.	Ki–54a: Army Type 1 Advanced Trainer Model A Ki–54b: Army Type 1 Operations Trainer Model B Ki–54c: Army Type 1 Transport Aircraft Model C Ki–54d: Army Type 1 Patrol Bomber Model D
Allied code name	Hickory
Manufacturer	Tachikawa Hikoki KK
Description	Twin-engine low-wing monoplane intended for operational training of bomber crews and used in various roles
Engines	Two 450-h.p. Army Type 98 (Hitachi Ha–13a) air-cooled radials
Span	17·9 m (58 ft 9 in)
Length	11·94 m (39 ft 2 in)
Height	3·58 m (11 ft 9 in)
Wing area	40 sq m (431 sq ft)

The Tachikawa Ki–54 was designed in response to a request for a twin-engine aircraft suitable for the simultaneous training of the entire crew of the kind of bomber used by the Japanese Army Air Force in 1939. As things turned out, the prototype was better suited to the training of pilots alone, and the Model A was used chiefly for that purpose. The Ki–54b, or Model B, came closer to the original conception and was manufactured in larger numbers than any other version. Model C was a transport aircraft with a crew of two and accommodation for eight passengers. Model D, built only in small numbers, was used for anti-submarine patrols. About 1,400 Ki–54s of all versions were manufactured between 1940 and the end of the war.

Tachikawa Ki–55

See Tachikawa Ki–36 and Ki–55

Tachikawa Ki–70

Official des.	Army Experimental High-Speed Command Reconnaissance Aircraft Ki–70
Allied code name	Clara
Manufacturer	Three prototype aircraft built by Tachikawa Hikoki KK
Description	Twin-engine mid-wing monoplane intended as successor to Ki–46
Engines	Two 1,900-h.p. Mitsubishi Ha–104M or 2,200-h.p. Mitsubishi Ha–211–I Ru air-cooled radials
Span	17·8 m (58 ft 5 in)
Length	14·5 m (47 ft 7 in)
Height	3·46 m (11 ft 4 in)
Wing area	43 sq m (463 sq ft)

The Tachikawa Ki–70 was intended as a successor to the Mitsubishi Ki–46 long-range reconnaissance aircraft. It was expected to attain a speed of more than 400 miles an hour in level flight. Two prototypes powered by Mitsubishi Ha–104M engines were tested in 1943. They proved difficult to handle and were considerably slower than the Ki–46–II. A third prototype with turbosupercharged engines was tried, but the aircraft was still unsatisfactory and the project was abandoned.

Tachikawa Ki–74

Official des.	Army Experimental High-Altitude Long-Range Bomber Ki–74
Allied code name	Patsy (formerly Pat)
Manufacturer	Tachikawa Hikoki KK
Description	Twin-engine long-range bomber-reconnaissance aircraft of mid-wing monoplane configuration
Engines	Two 2,000-h.p. Mitsubishi Ha–104 Ru air-cooled radials
Span	27 m (88 ft 7 in)
Length	17·65 m (57 ft 11 in)
Height	5·1 m (16 ft 9 in)
Wing area	80 sq m (861 sq ft)
Weight empty	10,200 kg (22,487 lb)
Weight loaded	19,400 kg (42,770 lb)
Crew	Five
Maximum speed	570 km/h at 8,500 m (354 m.p.h. at 28,000 ft)
Cruising speed	400 km/h at 8,000 m (250 m.p.h. at 26,000 ft)
Range	8,000 km (5,000 miles)
Service ceiling	12,000 m (39,400 ft)
Bomb-load	1,000 kg
Armament	One remotely-controlled 12·7-mm. Type 1 machine-gun in tail position

In 1939 the military authorities issued a specification calling for an aircraft with a range of 5,000 kilometres and a cruising speed of not less than 450 kilometres an hour, capable of reconnoitring west of Lake Baikal from bases in Manchukuo. A tentative design was prepared under the supervision of Dr H. Kimura of the Aeronautical Research Institute of the University of Tokyo, but the project was afterwards shelved because no suitable pressure-cabin was yet available. In 1941 the authorities revived it, stipulating that the aircraft should be capable of bombing as well as reconnaissance and of reaching the continental United States. A prototype powered by two 2,200-h.p. Mitsubishi Ha–211–I air-cooled radials was completed in March 1944. It was followed by two more prototypes with similar airframes but powered by turbosupercharged Ha–211–I Ru radials. Both versions of the Ha–211 proved troublesome. Thirteen pre-production aircraft powered by Ha–104 Ru turbosupercharged radials were then built, and received the designation Ki–74–I. They were still being tested when the war ended. A version capable of carrying a 2,000-kilogram bomb-load, to be called the Ki–74–II, was projected but not built. In addition a transport version of the Ki–74 was planned. The Allies received news of the project and at first believed that the aircraft was to be a long-range fighter. They changed their code name from Pat to Patsy when they learned that it was to carry bombs.

Tachikawa Ki–77

Official des.	Army Experimental Long-Range Research Aircraft Ki–77
Allied code name	None
Manufacturer	Two aircraft built by Tachikawa Hikoki KK
Description	Twin-engine intercontinental communications aircraft of low-wing monoplane configuration
Engines	Two 1,170-h.p. Nakajima Ha–115 air-cooled radials
Span	29·438 m (96 ft 7 in)
Length	15·3 m (50 ft 2 in)
Height	3·85 m (12 ft 8 in)
Wing area	79·6 sq m (856 sq ft)
Weight empty	7,237 kg (15,955 lb)
Weight loaded	16,725 kg (36,872 lb)
Crew	Five
Maximum speed	440 km/h at 4,600 m (273 m.p.h. at 15,000 ft)
Cruising speed	300 km/h (186 m.p.h.)
Calculated range	18,000 km (11,185 miles)
Longest non-stop flight	16,435 km (10,212 miles)
Service ceiling	8,700 m (28,500 ft)
Bomb-load	None
Armament	None

The genesis of the Ki–77 was a proposal made towards the end of 1939 by the proprietors of the newspaper *Asahi Shimbun* that the Aeronautical Institute of the University of Tokyo should design an aircraft capable of flying non-stop from Tokyo to New York. With the approval of the military authorities, a design was prepared under the supervision of Ryokichi Endo of Tachikawa and Dr Kimura of the Aeronautical Research Institute. Tachikawa hoped to have an aircraft ready by November 1941, but the date tentatively chosen for the first flight had to be postponed until the following February. Meanwhile the outbreak of war with the United States compelled the authorities to shelve the project. In the summer of 1942 they revived it in a form which envisaged non-stop flights to Rome and Berlin. The first Ki–77 was completed in September and made its maiden flight in November. In April 1943, it flew non-stop from the neighbourhood of Tokyo to Singapore, covering 3,312 miles in 19 hours 13 minutes. A second aircraft, first flown in May, was lost over the Indian Ocean in July while attempting a non-stop flight from Singapore to Berlin. Whether it was shot down by Allied fighters or met with an accident is not known. In the summer of the following year, the surviving aircraft set up an unofficial record by flying non-stop for 57 hours 12 minutes over a closed circuit, covering a distance of 10,212 miles. Although it was designed to fly at altitudes of the order of 20,000 to 30,000 feet, the Ki–77 had no pressure cabin. The cabin was sealed to prevent the escape of oxygen but was not pressurized.

Yokosuka Aircraft

Yokosuka B4Y1

Official des.	Naval Type 96 Carrier-borne Attack-Bomber
Allied code name	Jean
Manufacturers	Dai-Juichi Kaigun Kokusho Mitsubishi Jukogyo KK Nakajima Hikoki KK
Description	Three-seater carrier-borne torpedo-bomber of biplane configuration
Engine	840-h.p. Nakajima Hikari 2 air-cooled radial
Span	15 m (49 ft 3 in)
Length	10·15 m (33 ft 4 in)
Height	4·36 m (14 ft 4 in)
Wing area	50 sq m (538 sq ft)

The B4Y1 was designed by Sanae Kawasaki, of the 1st Naval Air Technical Arsenal (Dai-Ichi Kaigun Koku Gijitsusho) at Yokosuka, to meet the situation that arose when the Naval Type 92 Carrier-borne Attack-Bomber, intended to serve as a stop-gap until monoplane torpedo-bombers designed by Mitsubishi and Nakajima were ready, was seen in 1934 to be unsuitable for the purpose. Five prototypes were built at Yokosuka and some 200 production aircraft were manufactured between 1935 and 1938 by Mitsubishi, Nakajima and the 11th Naval Air Arsenal (Dai-Juichi Kaigun Kokusho). The B4Y1 had a maximum speed of 150 knots, a service ceiling of 6,000 metres and a range of 850 nautical miles. The light fleet carrier *Hosho*, attached to the Combined Fleet for training when Japan went to war in 1941, carried eight B4Y1s but was about to exchange them for more modern aircraft.

Yokosuka D3Y Venus

Official des.	Naval Type 99 Bomber Trainer Venus Model 22
Allied code name	None
Manufacturer	Matsushita Koko Kogyo KK
Description	Two-seater trainer of low-wing monoplane configuration constructed largely of wood
Engine	1,300-h.p. Mitsubishi Kinsei 54 air-cooled radial

Span	14 m (45 ft 11 in)
Length	11·215 m (36 ft 10 in)
Height	4·185 m (13 ft 9 in)
Wing area	32·8 sq m (353 sq ft)

In 1943 the naval authorities asked their suppliers to look into the possibility of designing aircraft which did not require great quantities of scarce raw materials and could be built largely by semi-skilled workers. The staff of the Yokosuka arsenal thereupon designed a trainer based on a training version of the Aichi D3A2 bomber, but with simplified contours and other modifications. Two prototypes were built at the arsenal, and Matsushita Koko Kogyo completed three production aircraft with the designation D3Y1–K, or Naval Type 99 Bomber Venus (*Myojo*) Model 22. A version to be used for suicide attacks was projected but not built. The D3Y1–K had a maximum speed of 243 knots at 6,200 metres, or roughly 20,000 feet, and a cruising speed of 160 knots at 3,000 metres.

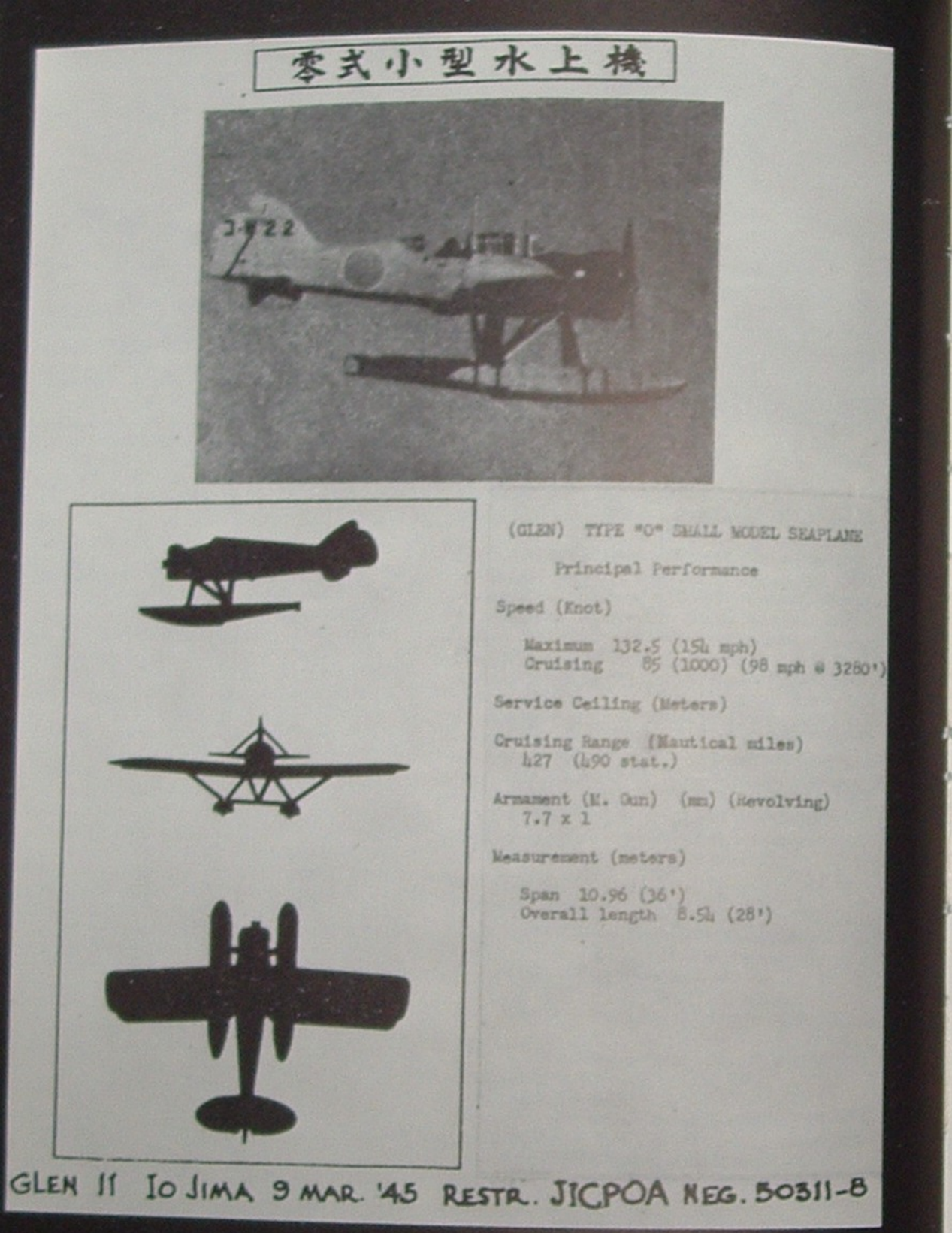
Yokosuka D4Y

Official des.	Naval Type 2 Carrier-borne Reconnaissance Aircraft Model 11, 12, 12A Naval Carrier-borne Bomber Comet Model 11, 21, 12, 12A, 22, 22A, 33, 33A Naval Comet–E Night Fighter
Allied code name	Judy (also called Dot)
Manufacturers	Aichi Kokuko KK Dai-Juichi Kaigun Kokusho
Description	Two-seater low-wing monoplane designed as carrier-borne dive-bomber and used also as carrier-borne reconnaissance aircraft and as land-based night fighter

75 Yokosuka D4Y Naval Type 2 Carrier-borne Reconnaissance Aircraft. Intended in the first instance to meet the demand for a dive-bomber suitable for light fleet carriers, the D4Y was used both as a carrier-borne armed reconnaissance aircraft and as a land-based night-fighter. The Allied code name was JUDY

Engine	D4Y1: 1,200-h.p. Aichi Atsuta 12 liquid-cooled V12 D4Y2: 1,400-h.p. Aichi Atsuta 32 liquid-cooled V12 D4Y3: 1,560-h.p. Mitsubishi Kinsei 62 air-cooled radial
Span	11·5 m (37 ft 9 in)
Length	10·22 m (33 ft 6 in)
Height	D4Y1: 3·675 m (12 ft 1 in) Later models: 3·74 m (12 ft 3 in)
Wing area	23·6 sq m (254 sq ft)
Weight empty	D4Y1: 2,440 kg (5,379 lb) D4Y2: 2,635 kg (5,809 lb) D4Y3: 2,501 kg (5,514 lb)
Weight loaded	D4Y1: 3,650 kg (8,047 lb) D4Y2: 3,835 kg (8,455 lb) D4Y3: 3,754 kg (8,276 lb)
Crew	Two (D4Y4 suicide aircraft, one)
Maximum speed	D4Y1: 298 knots at 4,750 m (15,500 ft) D4Y2: 313 knots at 5,250 m (17,250 ft) D4Y3: 310 knots at 6,050 m (20,000 ft)
Cruising speed	D4Y1: 230 knots at 3,000 m (10,000 ft) D4Y2: 230 knots at 2,000 m (6,500 ft) D4Y3: 180 knots at 3,000 m (10,000 ft)
Normal range	D4Y1: 850 nautical miles D4Y2: 790 nautical miles D4Y3: 890 nautical miles
Maximum range	D4Y1: 2,100 nautical miles D4Y2: 1,945 nautical miles D4Y3: 1,560 nautical miles
Service ceiling	D4Y1: 9,900 m (32,500 ft) D4Y2: 10,700 m (35,100 ft) D4Y3: 10,500 m (34,500 ft)
Bomb-load	Dive-bomber models: Normal, 310 kg; maximum, 560 kg D4Y4 suicide aircraft: 800 kg
Armament	Models without suffix 'A' (except D4Y2–S): Two fuselage-mounted 7·7-mm. Type 97 machine-guns and one flexibly-mounted 7·92-mm. Type 1 machine-gun firing to the rear Models with suffix 'A': Rearward-firing 7·92-mm. machine-gun replaced by 13-mm. Type 2 D4Y2–S: Two fuselage-mounted 7·7-mm. Type 97 machine-guns and one 20-mm. Type 99 Model 2 cannon firing at an angle to the line of flight

The Yokosuka D4Y was inspired by a now-forgotten German aircraft, the Heinkel He 118, but was not a copy of that aircraft. It was designed at the Yokosuka arsenal as a dive-bomber suitable for light fleet carriers and a replacement for the Aichi D3A2. The first D4Ys to be used on active service were not, however, dive-bombers but two Yokosuka-built prototypes modified as carrier-borne reconnaissance aircraft with the designation D4Y1–C. They were embarked in the 18,500-ton *Soryu* in time for the Battle of Midway Island, and were lost when the *Soryu* was sunk. Aichi manufactured D4Y1–Cs from the late summer of 1942, at first only in small numbers. Production of the D4Y1 *Suisei*, or Comet, was not authorized until the following March. About 140 D4Y1s and some thirty to forty D4Y1–Cs took part in the Battle of the Philippine Sea in the summer of 1944 and all, or nearly all, were lost. The great weakness of the D4Y1 was a lack of protection for crew and engine, and this mistake was repeated in the D4Y2, introduced some months later. The D4Y3, however, was powered by a radial engine which was not only considered more reliable than the liquid-cooled Atsuta, but also had the advantage of being rather less vulnerable. Variants of the D4Y included a night-fighter version, the D4Y2–S, and a version of the D4Y3 modified as a suicide bomber and designated the D4Y4. The D4Y5, a bomber version with protective armour for engine and crew, was under development when the war ended. Altogether some 1,700 aircraft of the D4Y1, D4Y2 and D4Y3 series and some 300 D4Y4s were completed.



76 Yokosuka E14Y Naval Type O Small Reconnaissance Seaplane. Small enough to be carried by a submarine when partially dismantled, the E14Y was the onlyJapanese aircraft known to have dropped bombs on the Continental United States. Submarine-borne E14Ys were used also to reconnoitre Peal Harbor, the Aleutians, and Allied bases in Australia, New Zealand, Madagascar and East Africa. The performance figures shown were Allied wartime estimates. GLEN was the code name given by the Allies to this unusual aircraft

Yokosuka E14Y1

Official des.	Naval Type O Small Reconnaissance Seaplane Model 11
Allied code name	Glen
Manufacturer	KK Watanabe Tekkosho
Description	Two-seater submarine-borne seaplane of low-wing monoplane configuration with twin floats
Engine	340-h.p. Hitachi Tempu 12 air-cooled radial
Span	11 m (36 ft 1 in)
Length	8·54 m (28 ft)
Height	3·8 m (12 ft 6 in)
Wing area	19 sq m (205 sq ft)

The E14Y was designed by Mitsuo Yamada of the Yokosuka arsenal. It was so constructed that it could, without too much difficulty, be dismantled for storage aboard a submarine and reassembled for flight. The prototype was built at the arsenal, and Watanabe manufactured 125 production aircraft. An E14Y1 reconnoitred Pearl Harbor after the surprise attack of 7 December 1941. Later, the only bombs to fall on the soil of the United States during the Second World War were dropped from an E14Y1 flying with a one-man crew and an augmented bomb-load. They fell in wooded country in Oregon. Submarine-borne E14Y1s were also used to reconnoitre Allied bases in Australia, New Zealand, Madagascar, the Aleutians, and East Africa. The aircraft had a maximum speed of 133 knots, a range of 476 nautical miles, and a service ceiling of 5,420 metres or approximately 17,500 feet.

Yokosuka K4Y1

Official des.	Naval Type 90 Training Seaplane
Allied code name	None
Manufacturers	KK Watanabe Tekkosho Nippon Hikoki KK
Description	Two-seater biplane trainer with twin floats
Engine	160-h.p. Hitachi Kamikaze 2 air-cooled radial
Span	10·9 m (35 ft 9 in)
Length	9·05 m (29 ft 8 in)

Designed at the Yokosuka arsenal in 1930, the K4Y1 was still used by the navy as a primary trainer during the war of 1941–5. Its maximum speed was 88 knots at sea level, its range 170 nautical miles. Watanabe completed about 150 aircraft of the production series between 1932 and 1939, Nippon Hikoki some fifty in 1939 and 1940.

Yokosuka K5Y1 and K5Y2

Official des.	Naval Type 93 Intermediate Trainer
Allied code name	Willow
Manufacturers	Dai-Ichi Kaigun Kokusho Fuji Hikoki KK Hitachi Kokuki KK Kawanishi Kokuki KK Mitsubishi Jukogyo KK Nakajima Hikoki KK Nippon Hikoki KK KK Watanabe Tekkosho
Description	Two-seater biplane trainer with fixed undercarriage or twin floats
Engine	340-h.p. Hitachi Amakaze 11 air-cooled radial
Span	11 m (36 ft 1 in)
Length	K5Y1: 8·05 m (26 ft 5 in) K5Y2: 8·78 m (28 ft 10 in)
Height	K5Y1: 3·2 m (10 ft 6 in) K5Y2: 3·68 m (12 ft 1 in)
Wing area	27·7 m (298 sq ft)

The immediate forerunner of the K5Y intermediate trainer was a training aircraft, the Naval Type 91, of which two prototypes were built in 1931 at the 1st Naval Air Technical Arsenal (Dai-Ichi Kaigun Koku Gijitsusho) at Yokosuka. In 1932 the naval authorities asked Kawanishi Kokuki to develop, in association with experts from Yokosuka, an improved version of the Type 91 trainer. A prototype was completed in December 1941, tested in the same month, and almost immediately accepted as the basis of a production model. Bearing the designation K5Y1 in landplane and K5Y2 in seaplane form, the K5Y was manufactured in larger numbers than any other Japanese training aircraft and was in continuous production from the end of 1933 until the summer of 1945. Altogether close on 5,800 K5Ys were built. Nearly half came from Nippon Hikoki, some 1,400 from Hitachi. Fuji Hikoki built about 870, Watanabe some 550. Kawanishi, Mitsubishi, Nakajima and the 1st Naval Air Arsenal (Dai-Ichi Kaigun Kokusho) produced relatively few.

77 & 80 (Top left and right) Yokosuka MXY7 Naval Suicide Attacker *Ohka* (Cherry Blossom). The four pictures show an *Ohka* missile carried by a Mitsubishi G4M2e bomber, and (below) a missile on the ground. The Allies called the missile BAKA

Yokosuka MXY7 Cherry Blossom

Official des.	Naval Suicide Attacker Cherry Blossom Model 11, Model 22
Allied code name	Baka
Manufacturers	Dai-Ichi Kaigun Koku Gijitsusho Dai-Ichi Kaigun Kokusho
Description	Rocket-propelled or jet-propelled piloted missile of mid-wing monoplane configuration with twin fin-and-rudder assembly
Engine	Model 11: Three Type 4 Mark 1 Model 20 solid-fuel rockets Model 22: Campini-type Tsu-11 turbojet
Span	Model 11: 5·12 m (16 ft 10 in) Model 22: 4·12 m (13 ft 6 in)
Length	Model 11: 6·066 m (19 ft 11 in) Model 22: 6·88 m (22 ft 7 in)
Height	Model 11: 1·16 m (3 ft 10 in) Model 22: 1·15 m (3 ft 9 in)
Wing area	Model 11: 6 sq m (65 sq ft) Model 22: 4 sq m (43 sq ft)

The Yokosuka MXY7 *Ohka*, or Cherry Blossom, was an anti-shipping missile piloted by an airman willing to give his life for a hit on an Allied warship or transport. It was planned by a naval airman, Ensign Mitsuo Ohta, with the help of the Aeronautical Research Institute of the University of Tokyo, and detailed drawings were prepared by the staff of the Yokosuka arsenal. The idea was that the missile should be launched from a specially modified Mitsubishi G4M2 and approach the target under power after starting with a glide. Between September 1944 and March 1945, the Yokosuka arsenal completed about 150, and the 1st Naval Air Arsenal at Kasumigaura about 600 of these missiles, using wings and tails manufactured by Fuji Hikoki KK and Nippon Hikoki KK. The missile was first used against the enemy on 21 March 1945, but the results were disappointing. Sixteen G4M2e aircraft used as parent aircraft were so slow and sluggish that all were intercepted on their way to the target and released their missiles prematurely. Later some hits were scored, but the results scarcely justified the effort put into the project. A more advanced version of the *Ohka*, the Model 22, was propelled by a rudimentary turbojet and intended to be carried by the Yokusuka P1Y1 Milky Way. Large-scale production was to have been undertaken by Aichi, with Fuji Hikoki, Miguro Hikoki KK and Murikami Hikoki KK as subcontractors, but only some fifty pre-production missiles built at Yokosuka were completed. Versions to be known as the Model 33, Model 43A and Model 43B were projected but not built.

Yokosuka P1Y

Official des.	P1Y1: Naval Bomber Milky Way Model 11 P1Y2: Naval Bomber Milky Way Model 16 P1Y1-S: Naval Fighter White Light P1Y2-S: Naval Fighter Aurora
Allied code name	Frances
Manufacturers	Nakajima Hikoki KK Kawanishi Kokuki KK
Description	Three-seater mid-wing monoplane designed as land-based medium bomber, dive-bomber and torpedo-bomber but used also as night fighter
Engines	P1Y1 & P1Y1-S: Two 1,820-h.p. Nakajima Homare 11 or 1,825-h.p. Nakajima Homare 12 air-cooled radials P1Y2 & P1Y2-S: Two 1,850-h.p. Mitsubishi Kasei 25a air-cooled radials
Span	20 m (65 ft 8 in)
Length	15 m (49 ft 3 in)
Height	4.3 m (14 ft 2 in)
Wing area	55 sq m (592 sq ft)
Weight empty	Early models: 7,265 kg (16,017 lb) Later models: 7,800 kg (17,196 lb)
Weight loaded	10,500 kg (23,149 lb)
Crew	Three
Maximum speed	P1Y1 & P1Y1-S: 295 knots at 5,900 m (19,400 ft) P1Y2 & P1Y2-S: 282 knots at 5,400 m (17,700 ft)
Cruising speed	200 knots at 4,000 m (13,000 ft)
Normal range	P1Y1 & P1Y1-S: 1,036 nautical miles P1Y2 & P1Y2-S: Not known
Maximum range	P1Y1 & P1Y1-S: 2,900 nautical miles P1Y2 & P1Y2-S: 2,150 nautical miles
Service ceiling	P1Y1 & P1Y1-S: 9,400 m (30,840 ft) P1Y2 & P1Y2-S: 9,560 m (31,400 ft)

81 Yokosuka P1Y1 Naval Bomber Ginga (Milky Way) Model 11. The P1Y2, used both as a bomber and as a night-fighter with the designation P1Y2-S,was very similar. The Allies called all versions FRANCES

Bomb-load	*One 800-kg torpedo or up to 1,000 kg of bombs*
Armament	*P1Y1 & P1Y2 (models with no suffix): One flexibly-mounted 20-mm. Type 99 cannon in the nose and one firing to the rear* *P1Y1a & P1Y2a: Rearward-firing cannon replaced by 13-mm. Type 2 machine-gun* *P1Y1b & P1Y2b: One flexibly-mounted 20-mm. Type 99 cannon in the nose and twin 13-mm. Type 2 machine-guns in dorsal turret* *P1Y1c & P1Y2c: Cannon in the nose replaced by 13-mm. Type 2 machine-gun* *P1Y1-S: One rearward-firing 13-mm. Type 2 machine-gun, and four 20-mm. Type 99 cannon firing obliquely* *P1Y2-S: One rearward-firing 20-mm. Type 99 cannon and two firing obliquely*

The Yokosuka P1Y was intended as a fast medium bomber which could be used for high-level bombing and also as a dive-bomber and torpedo-bomber. It was designed at the Yokosuka arsenal, but its development was entrusted to Nakajima, who completed a prototype by the late summer of 1943. Production began almost immediately, but complaints were made that the aircraft was difficult to maintain. The result was that some 450 P1Y1s had been delivered by the time the aircraft was formally accepted for service use more than a year later. By that time, too, there was an urgent demand for defensive fighters. Some P1Y1s were modified as night fighters with the designation P1Y1-S, or Naval Fighter White Light, and Kawanishi undertook the manufacture of a special night fighter version, the P1Y2-S or Naval Fighter Aurora. The bomber version was known as the *Ginga*, or Milky Way. As a high-altitude fighter the P1Y proved unsatisfactory, and in consequence a number of P1Y2s were transformed into bombers and became the Naval Bomber Milky Way Model 16. Nearly a thousand P1Y1s (including those modified as night fighters) were built by Nakajima, about a hundred P1Y2s by Kawanishi. Advanced versions of the P1Y, to be designated the P1Y3, P1Y4, P1Y5 and P1Y6, were projected, but none of these was completed even in prototype form.

Appendix

82 Kokusai Ki-86 Army Type 4 Primary Trainer. Identical except in the details of its equipment with the Kyushu K9W1 Naval Type 2 Primary Trainer *Momiji* (Maple) Model 11, the Ki-86 was a licence-built version of the Bücker Bü 131 two-seater primary trainer, called by its German manufacturer the Jungman. The Allies applied the code name CYPRESS to both versions

Foreign Aircraft Built under Licence

During the war of 1941–45 the Japanese naval and military authorities made some use of aircraft of foreign design built by Japanese aircraft manufacturers under licence, either before or after the outbreak of hostilities. The only licence-built aircraft which played any significant part in the war are listed below.

Douglas DC–2

In 1934 Nakajima acquired Japanese rights in the manufacture and sale of the Douglas DC-2, a passenger aircraft of low-wing monoplane configuration with a span of 84 feet 7 inches and a maximum speed of roughly 200 miles an hour. Between 1935 and 1937 they assembled one aircraft from imported components and built five for Nippon Koku KK. All six aircraft were powered by Wright Cyclone SGR-1820-F2 engines, but the five aircraft built *ab initio* in Japan were afterwards re-equipped with Wright Cyclone SGR-1830-F52s. These five aircraft were used by Nippon Koku and its successor, Dai Nippon Koku, to carry passengers and mail between Japan and Formosa. The aircraft assembled from imported components was requisitioned after the outbreak of war with the United States by the navy. The Allies believed, wrongly, that licence-built DC-2s were used on a considerable scale by the army. They gave the Japanese version of the aircraft the designation Tess.

Bücker Bü 131

As the outcome of a series of transactions between Bücker Flugzeugbau GmbH, the Japanese naval authorities and KK Watanabe Tekkosho (afterwards Kyushu Hikoki KK), arrangements were made in 1942 for the manufacture in Japan of the Bücker Bü 131, a small two-seater biplane trainer with a span of 24 feet and a maximum speed of 112 miles an hour. Japanese-built Bü 131s were powered by the 110-horse-power Hitachi Hatsukaze 11 air-cooled in-line engine. About 340 aircraft built for the navy by Kyushu and Hitachi were designated the K9W1 Maple, or Naval Type 2 Primary Trainer Model 11. More than 1,000 almost identical aircraft built by Nippon Kokusai Koku Kogyo KK for the army received the designation Kokusai Ki-86, or Army Type 4 Primary Trainer. The Allies gave the code name Cypress to both versions.

Douglas DC–3 (L2D)

In 1938 Mitsui Bussan Kaisha KK acquired through a subsidiary company, and on the initiative of the naval authorities, a licence to manufacture the Douglas DC-3, a passenger aircraft with a span of 95 feet and a maximum speed of some 220 miles an hour. As a separate transaction, Mitsui bought the components of two aircraft. These two aircraft, powered by 1,000-horse-power Pratt and Whitney air-cooled radials, were assembled by Showa Hikoki Kogyo KK and received the designation L2D1. They were completed in 1939 and 1940. Between 1941 and 1945 Showa completed 414 L2D2s or L2D3s powered by Mitsubishi Kinsei 43, 51 or 53 radials, and a further 71 were built between 1940 and 1942 by Nakajima. These were officially designated Naval Type O Transport Aircraft Model 11 (L2D2 and L2D2-1) or Model 22 (L2D3, L2D3a, L2D3-1, L2D3-1a). The L2D2-1, L2D3-1 and L2D3-1a were modified versions with floors strengthened for the carriage of cargo and large doors to facilitate loading and unloading. The Allies applied the code name Tabby to all versions.

Lockheed 14–WG3

Before the outbreak of the war of 1941–45, Tachikawa Hikoki KK bought from the Lockheed Aircraft Corporation not only thirty passenger aircraft of the Lockheed 14-WG3 series, but also a licence to manufacture the aircraft in Japan. In 1939 the military authorities accepted their proposal that a version suitable for service use should be put into production. Between 1940 and 1942 Tachikawa built sixty-four aircraft, powered by 900-horse-power Army Type 99 air-cooled radials, which received the designation Army Type LO Transport Aircraft. Kawasaki built fifty-five in 1940 and 1941, and then switched to their own derivative of the Lockheed aircraft, the Kawasaki Ki-56. The type LO, with a span of 49 feet 3 inches and a wing area of 552 square feet, was a lively performer, with a maximum speed of some 260 miles an hour. In 1943 Tachikawa produced an advanced version, the Tachikawa SS-1, with a pressure cabin and a service ceiling of nearly 33,000 feet, but it was purely an experimental model and was not put into production.

The Allies applied the code name Toby to the Lockheed aircraft imported before the outbreak of war and used by Dai Nippon on scheduled routes. The Type LO aircraft built between 1940 and 1942 and used by the army they called Thelma.

Messerschmitt 163B

See Mitsubishi J8M (Ki-200).

North American NA–16–4R

About two years before the outbreak of war with the United States, the Japanese naval authorities acquired through an intermediary a licence to manufacture in Japan the North American NA-16-4R. This was a two-seater intermediate or advanced trainer of low-wing monoplane configuration, powered by a 450-horse-power Pratt and Whitney engine. Watanabe produced in 1941 a modified version powered by a 600-horse-power Nakajima Kotobuki 2 KAI air-cooled radial. With a span of rather more than forty feet and a wing area of 240 square feet, it was capable of 150 knots or so and had a service ceiling of just under 24,000 feet. In the same year, the naval authorities accepted it for production as the Naval Type 2 Intermediate Trainer, or Kyushu K10W1. Watanabe built twenty-six aircraft of the production series in 1941 and 1942, Nippon Hikoki KK about 150 in 1943 and 1944. The Allied code name for the K10W1 was Oak.

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A former novelist, critic and travel writer, Basil Collier served during World War II on the staff of Headquarters, Fighter Command, and at Supreme Headquarters, Allied Expeditionary Force. At the end of the war in Europe he was appointed Air Historical Officer, Fighter Command. After his return to civilian life he joined the Cabinet Office as one of the officially-sponsored historians of World War II. His publications include **The Defence of the United Kingdom, The Battle of Britain, A Short History of the Second World War, The War in the Far East, 1941-1945, Japan at War,** and a study of twentieth-century British and Anglo-American strategy, **The Lion and the Eagle.** He is married, with three children, and lives in Sussex.

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Front[illegible] photograph: Nakajima Ki-84 Army Type 4 Fighter **Hayate** (Gale), Allo[illegible] name FRANK. (By courtesy of Koko-Fan, Bunrin Do)

Back[illegible] photograph: Japanese recruiting poster. (Robert Hunt Picture Libra[illegible]

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